THE AEROPLANE and ASTRONAUTICS

EQUIPMENT AND CARGO HANDLING

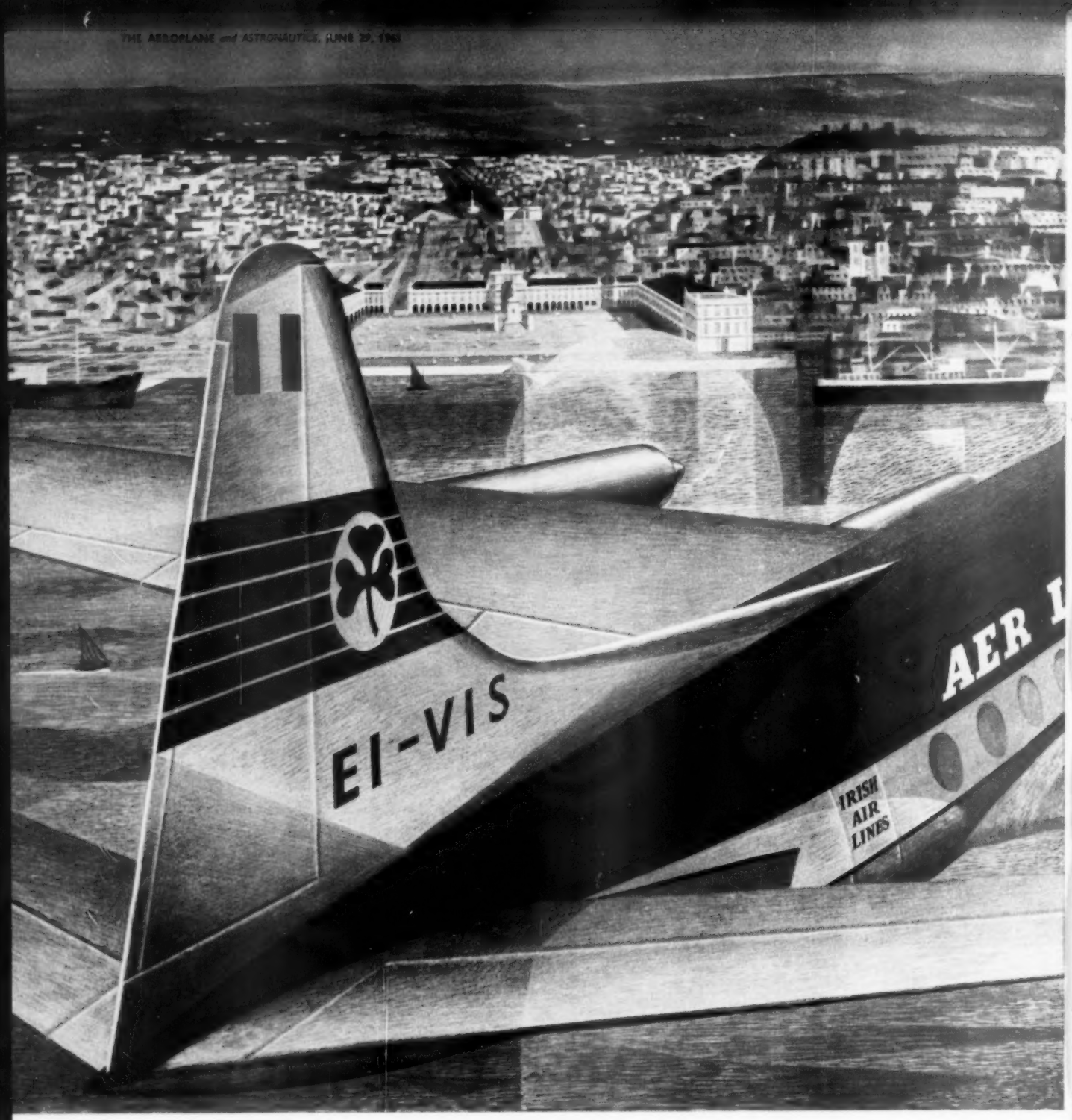
BEA Buys the Argosy

The Armstrong Whitworth Argosy has been ordered by British European Airways to begin operations on European freight routes this winter. ☐ By ordering the Argosy, BEA have acknowledged that air freight is a service on its own rather than just an ancillary to passenger operations. ☐ The Rolls-Royce Dart powered Argosy with its large unobstructed freight hold, double-end loading and "Rolamat" cargo handling system, can handle and carry heavy and bulky freight easily and economically. BEA can now prove that:

The Argosy brings the cost of air freight down to earth

HAWKER SIDDELEY AVIATION

32 Duke Street, St. James's, London, S.W.1

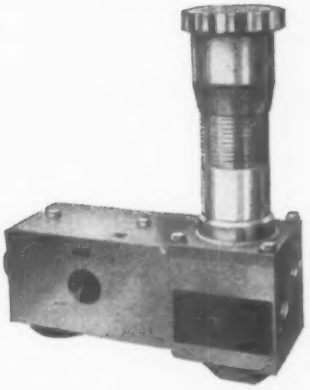


Ten years with Aer Lingus

In the Lisbon circuit, a Viscount of Aer Lingus. From small beginnings twenty-five years ago the Aer Lingus network has grown to encompass thirty cities of Europe as well as transatlantic New York. AIR BP has served the Aer Lingus European network for ten years. At Lisbon AIR BP fuels seven major airlines with the speed and command of detail that comes of perfect teamwork and full understanding of the operator's needs.

Fast flying AER LINGUS... fast fuelling AIR BP

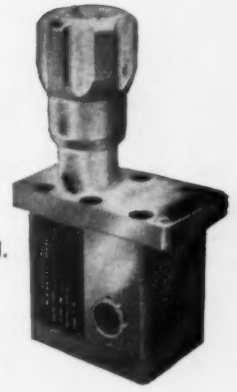
If you've a hydraulic problem



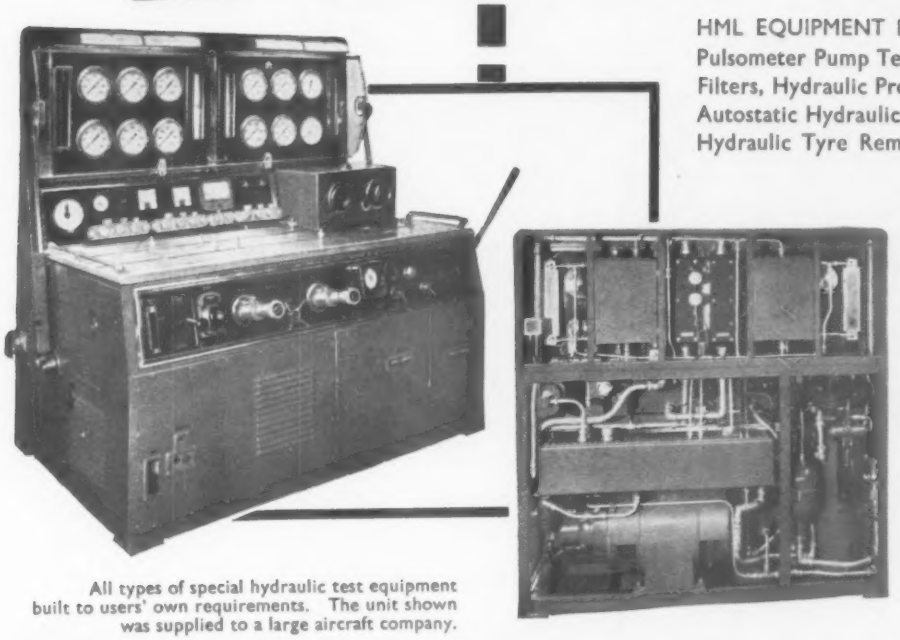
Experienced engineers at HML are always ready to get to grips with problems arising from the design requirements of modern hydraulic systems. You'll find HML Ministry approved units and components used and relied upon wherever high standards of performance are recognised.

HML VARIABLE PRESSURE REDUCER VALVE

The only pressure reducing valve on the market today that will maintain set reduced pressure under varying pressure and flow conditions. Pressure range 0-5000 p.s.i. Flow range 0-10 g.p.m.



... bring it to HML



All types of special hydraulic test equipment built to users' own requirements. The unit shown was supplied to a large aircraft company.

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* * British and Foreign Patents pending.

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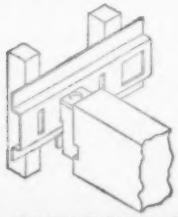

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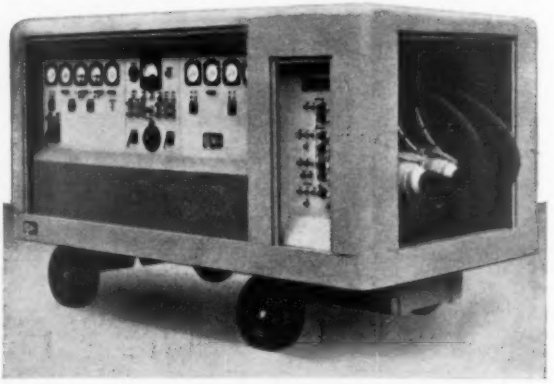

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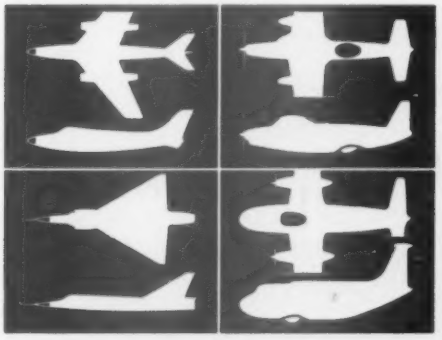

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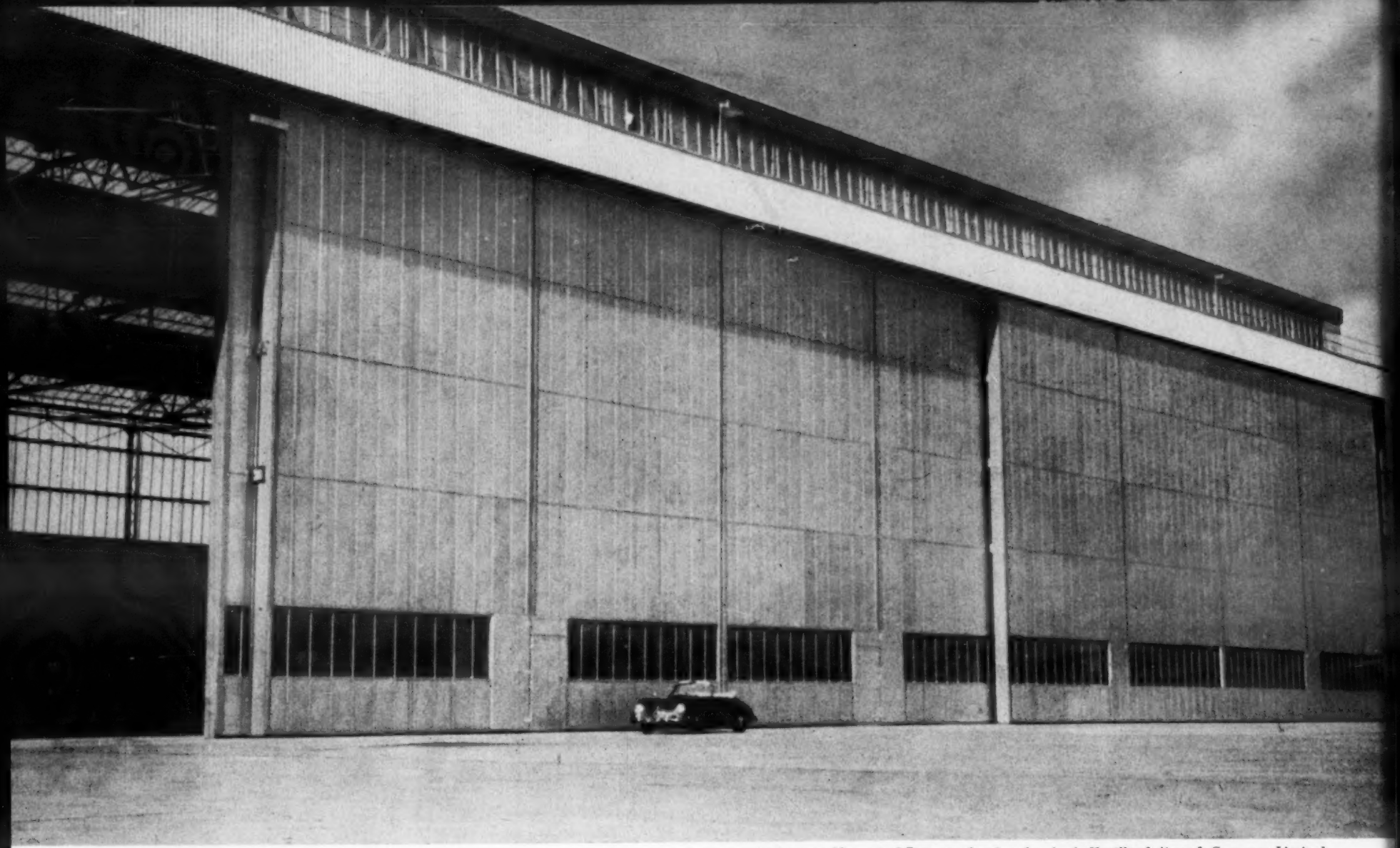

Architects: Monro and Partners, London, for the de Havilland Aircraft Company Limited

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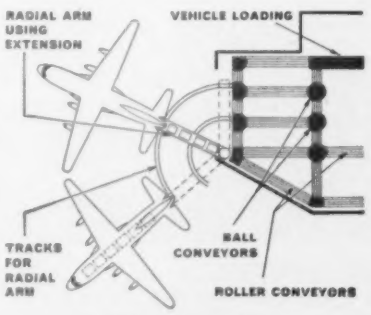

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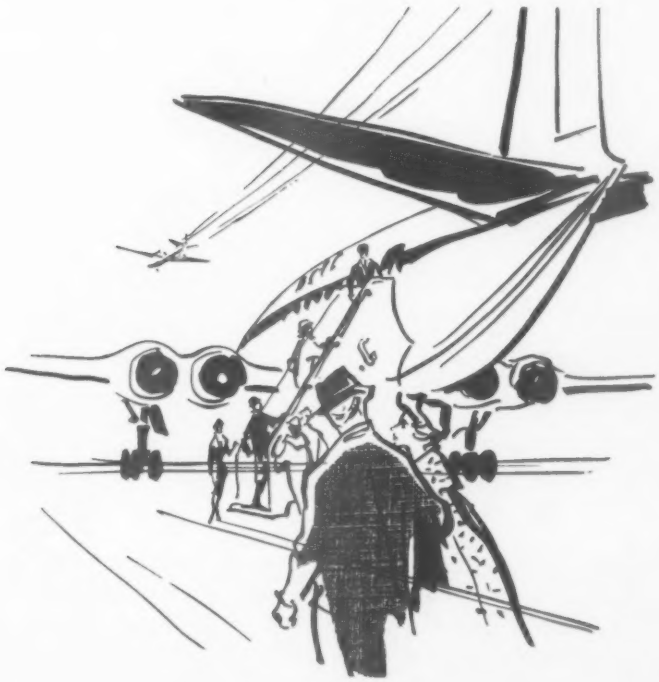

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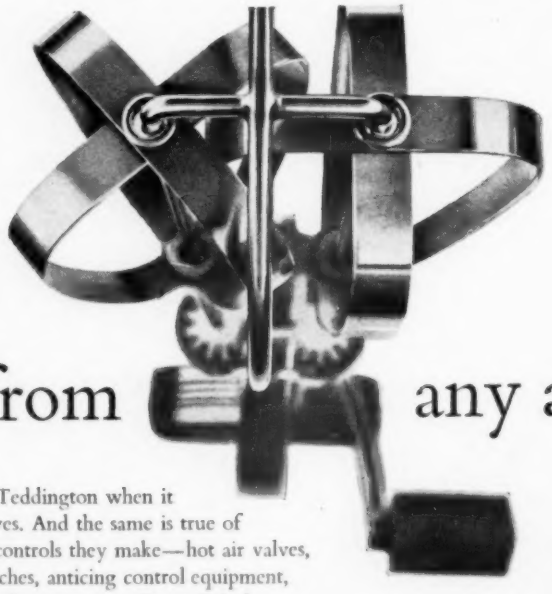

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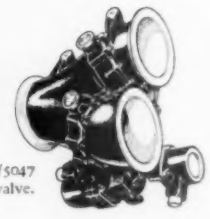

Type FMP/A/5047
two-way, hot air mixing valve.

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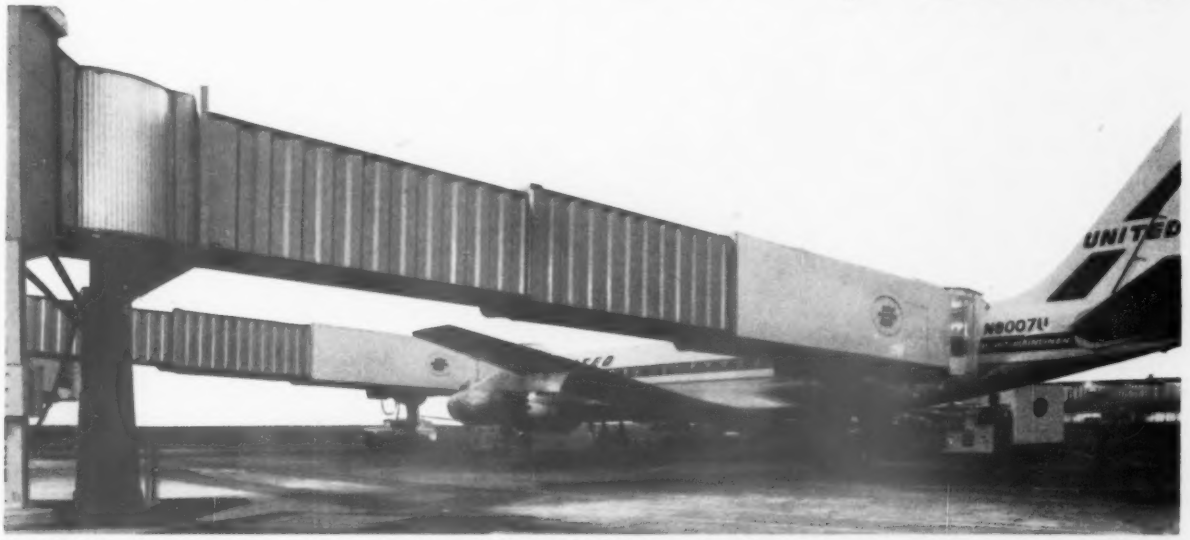

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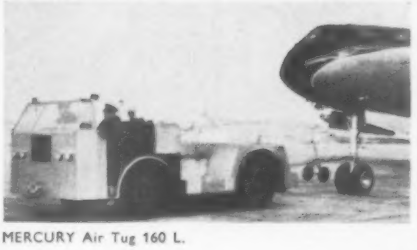
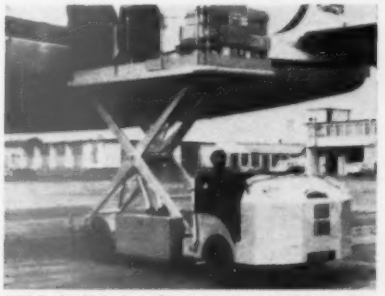


MERCURY Air Tug 160 L.



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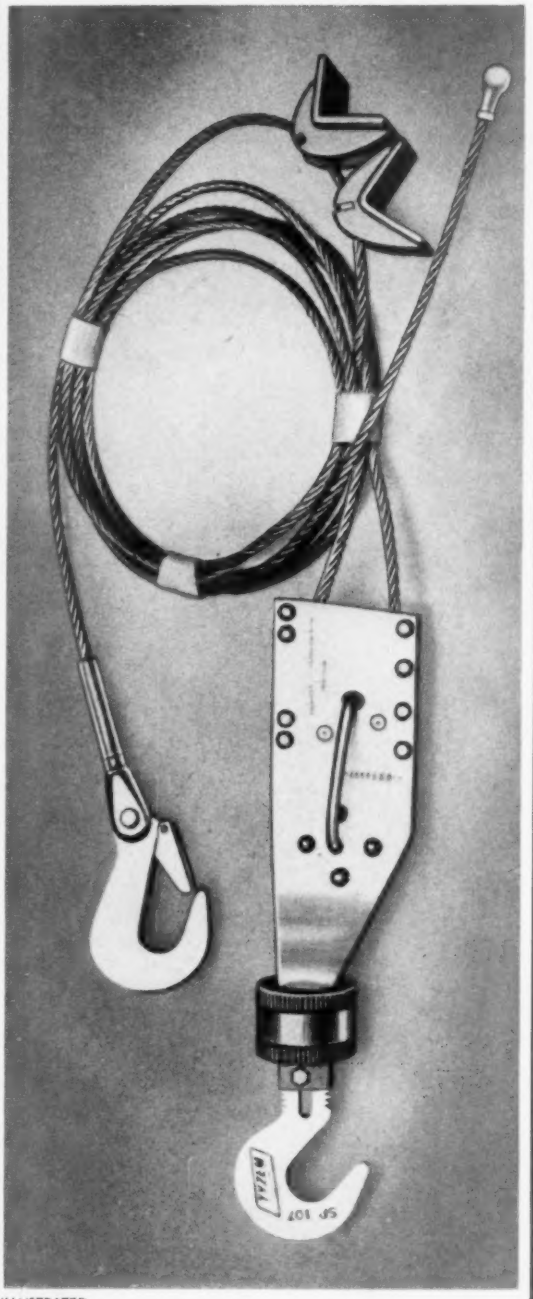

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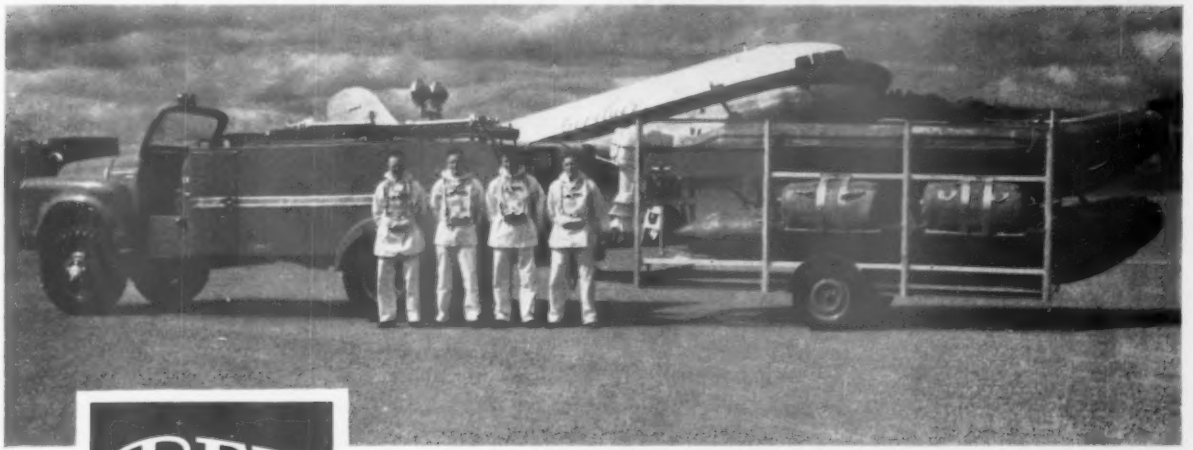

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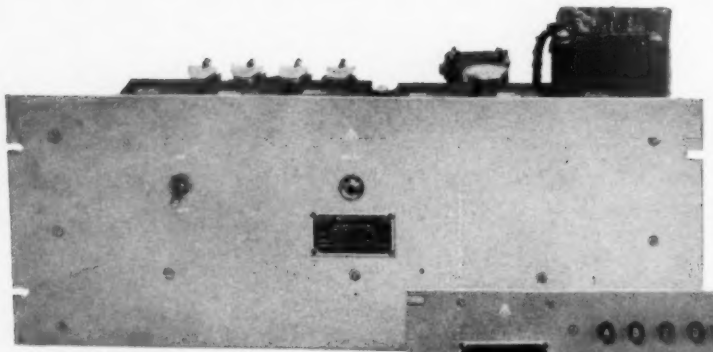

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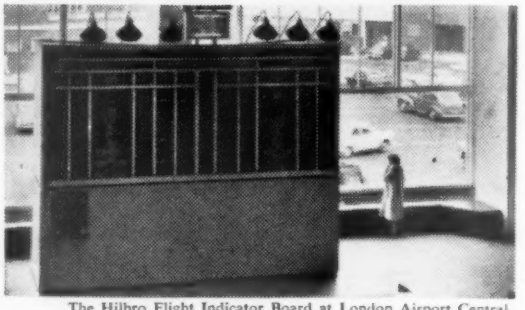

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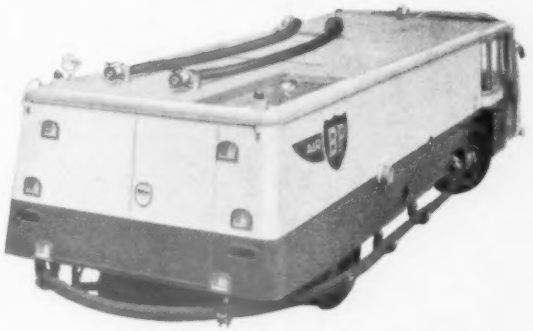

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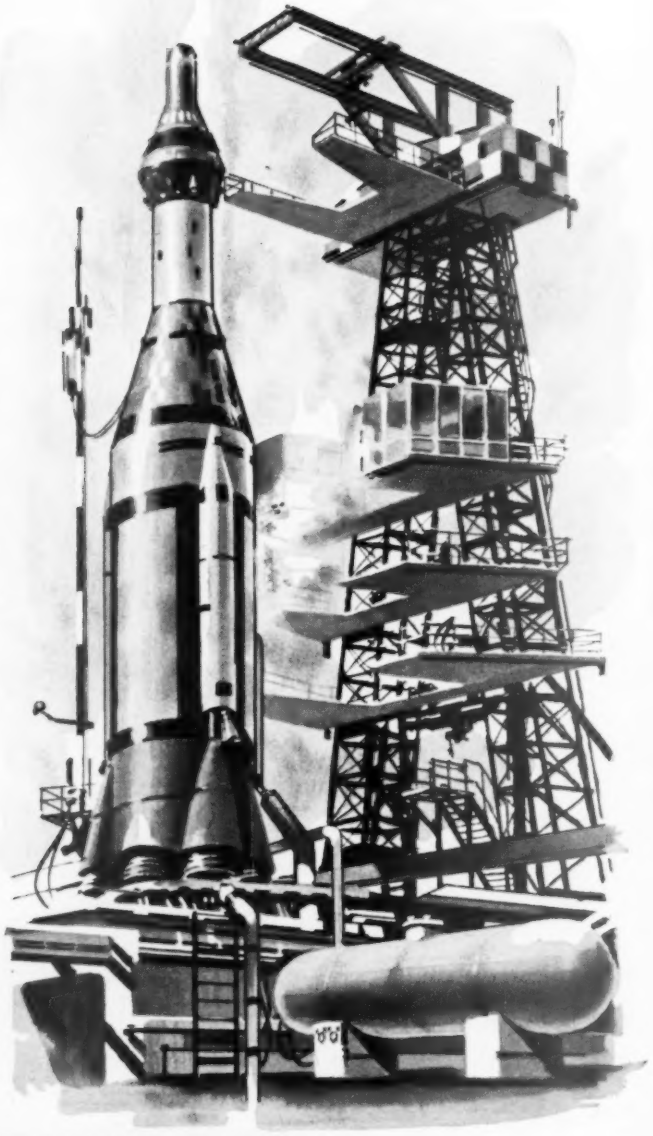

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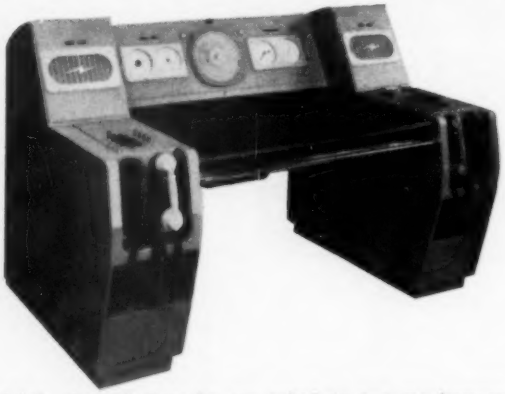

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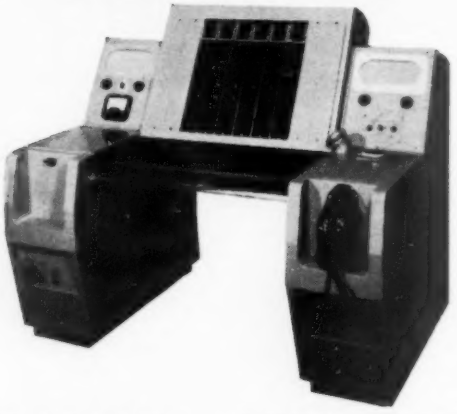

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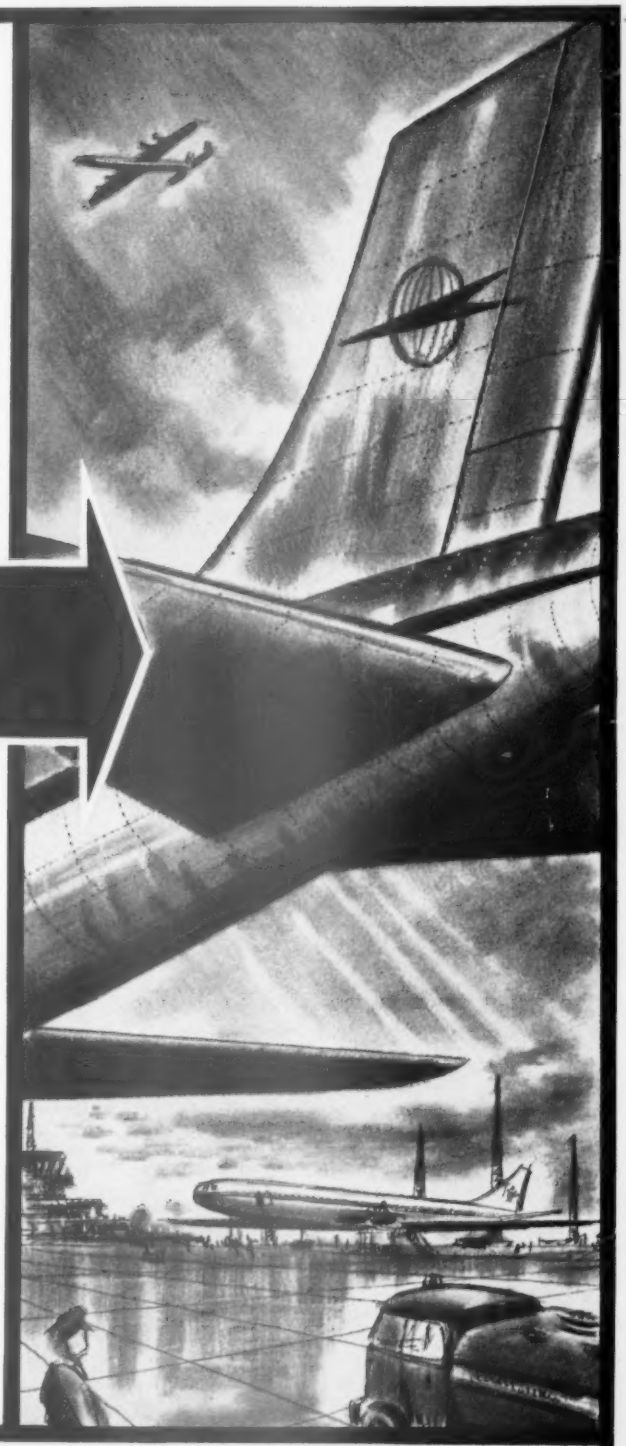

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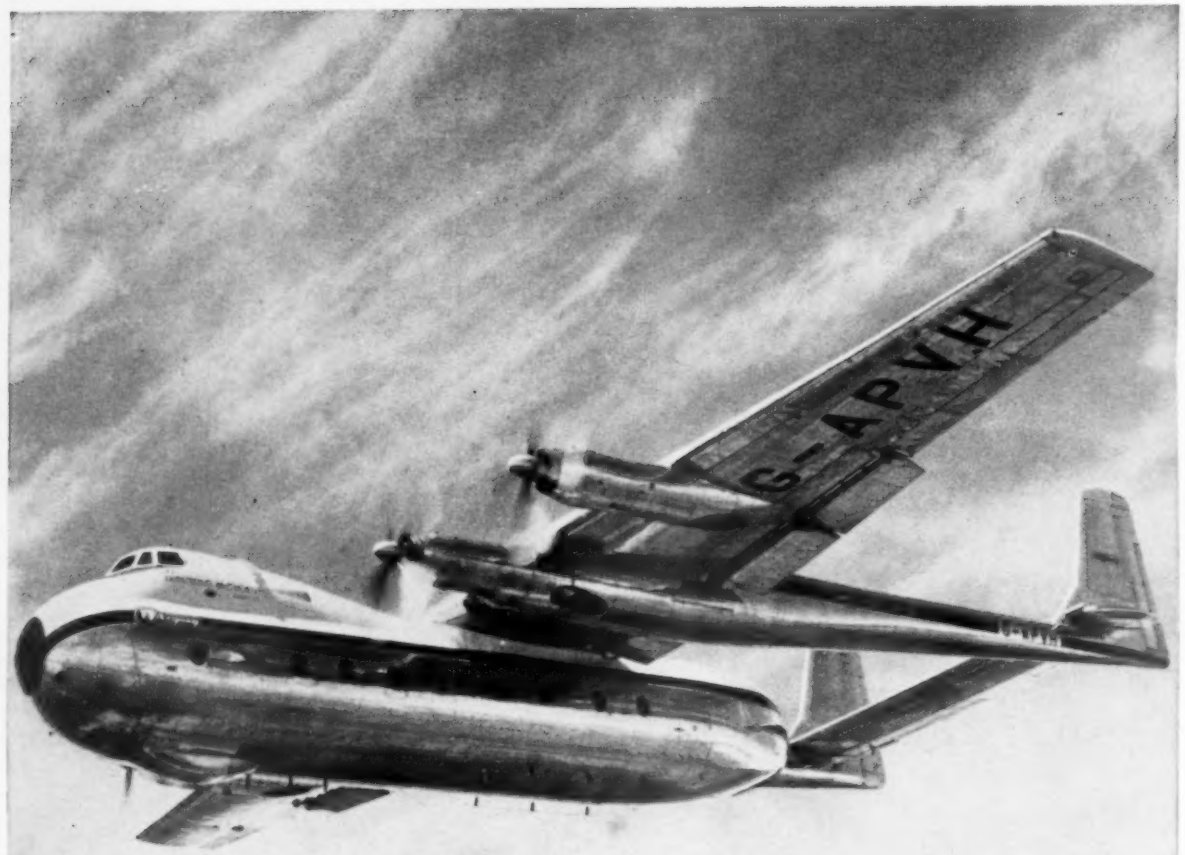

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THE AEROPLANE and ASTRONAUTICS

VOLUME 100 NUMBER 2593 JUNE 29, 1961

Cunard's 25-year Wait

Understandably, last week's grant by the new Air Transport Licensing Board of an air service licence to Cunard Eagle Airways for the London-New York route has been hailed as highly significant. Indeed it is, though one may well remind oneself that agreement between the British and American Governments has to be reached before Cunard Eagle can start the service as planned in May, 1962. And should any American operator raise objections, the procedure necessary before such inter-governmental agreement could be reached might prove lengthy. Moreover, before formal application can be made by the U.K. Government to the U.S., B.O.A.C. is to appeal against the decision. This may well be on the ground that the Board's decision is contrary to the promise given by Mr. Duncan Sandys on the second reading of the Civil Aviation (Licensing) Bill. He said that the Corporations, "having built up custom on a particular route . . . will be given some reasonable protection against interlopers who seek to reap where others have sown."

What is significant also is that the Board has firmly grasped the nettle of "material diversion." The fact that a new operator will in all probability carry traffic which the Corporation might otherwise have carried is no bar, says the Board, to the granting of a licence. This will certainly be encouraging news for the nine operators whose 71 applications for European and African routes are now being heard.

It is not without irony that Cunard tooks steps to participate in transatlantic air transport as long ago as 1937. As a letter from the former managing director of Imperial Airways, Ltd., Major Woods-Humphery recalls, on p. 738 of this issue, it had always been part of I.A.L. policy to collaborate with the shipping and railway companies. His letter is a timely reminder of how commercial acumen may be frustrated by Government policy.

The Board has expressed the view that two British operators will, in the long run, gain a greater share of the total traffic on the North Atlantic route than one. Here is the heart of the matter. If the Board is proved right, then the decision must ultimately be for the good of British aviation as a whole, and June 22, 1961, will go down in history as a red-letter day in the struggle by British independent airlines for long-awaited freedom. And that freedom will certainly be welcomed as heralding a wider home market for British aircraft.

The Shrinking Time-scale

Impressive though they may be, the bare facts of the recent remarkable non-stop journey of a Royal Air Force Vulcan bomber from England to Australia in an elapsed time of less than 24 hours, seem to do less than justice to such an outstanding achievement. Quite apart from any practical demonstration of the mobility and flexibility of the units making up our deterrent V-bomber force, to travel half way round the World in less than a day is a salutary reminder—if one were needed—of the ever shrinking time-scale between the major cities and centres of population of the World.

In the foreseeable future, the Vulcan's semi-global circumnavigation will become a commonplace experience for fare-paying passengers—but at supersonic speeds. Such is progress. But while speeds continue to rise and journey times shrink, so also do the corresponding technological complexities increase. This, of course, is quite acceptable provided that whatever else happens, overall safety is not put in jeopardy; high cruising speeds for civil craft must never be obtained at the expense of a lethal landing velocity.

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Matters of Moment

Relaxing the L.A.P. Rules

FOR a trial period of three months, private, executive and non-scheduled aircraft are being allowed to use London (Heathrow) Airport without prior permission, in off-peak hours. The new arrangements, which follow discussions between the M.o.A., the Royal Aero Club and the Business Aircraft Users Association, will be made permanent if the trial proves satisfactory.

The "restricted" hours, during which this concession does not apply, are, for international flights, 07.30 to 11.30 hrs. and 17.00 to 19.00 hrs. B.S.T., and for domestic flights, 08.00 to 10.00 hrs. for take-offs and 16.00 to 18.00 hrs. for landings. Also restricted are the whole of the week before and after public holidays. Outside these times, prior permission to use the airport is not now needed, provided that the aircraft has two or more engines and carries appropriate radio and navaids including ILS, and that the pilot holds an instrument rating.

As a further concession to the private owner, the Ministry is now conducting trials to establish standard routes and procedures for single-engined and light twin aircraft, less fully equipped, and whose pilots do not have an instrument rating. These will be allowed to use the airport in due course on a "special visual flight rules clearance" in VMC provided that they have at least the VHF/RT frequencies to communicate with the airport approach/director, airport tower and airport ground movement control.

All aircraft using the airport under these regulations will be parked in the central terminal area (international flights) or the No. 2 maintenance area (domestic flights). The North Terminal Area will not be available to non-scheduled aircraft, and no ground handling facilities will be provided by the Ministry. Prior arrangements must be made with handling agents for aircraft requiring apron services.

New from Southend

LAST WEEK a new aircraft—the Aviation Traders ATL-98 Carvair vehicle ferry—made its first flight from Southend's Municipal Airport. Although strictly a conversion of the well-proven Douglas DC-4 airframe, the transformation has involved the design and incorporation, forward of the mainplane, of a completely new front fuselage of such a size that the term "new" is amply justified. A cutaway drawing and details of the background and design development of this interesting specialist newcomer are on pages 749 to 752 of this issue.

For its maiden flight the Carvair was airborne for two hours in the hands of Capt. D. Cartlidge, one of Aviation Traders (Engineering), Ltd.'s two senior test pilots. He was accompanied by Capt. R. Langley as first officer and standby pilot, and by Mr. K. W. Smith as flight test engineer. During the flight Decca equipment was used as a primary navigation aid in order to help the crew avoid danger areas and controlled air space.

Flown at a comparatively light weight (54,000 lb.) and with a mid position of the C.G., the aircraft was given a preliminary handling test at heights between 2,000 and 6,000 ft. Speeds of up to 210 m.p.h. were reached and after an assessment of control circuit friction and control effectiveness the lower end of the speed scale down to about 97 m.p.h. was explored. According to this preliminary flight test the drag penalty from the new nose is likely to be about 11-12 m.p.h., giving a cruising speed of 200 m.p.h. at a mean weight of 65,000 lb. (the normal all-up weight of the aircraft is 73,000 lb.). Full stalls were not explored on this first flight.

During its first flight the Carvair was accompanied by a "chase" aircraft—a Cessna 310D flown by the company's other senior test pilot, Capt. L. P. Griffith. In the Cessna with him were Mr. J. R. Batt, technical director of Aviation Traders; Mr. A. C. Leftly, the chief designer; and Mr. C. W. Murrell, the chief inspector.

INSPECTING THE DETERRENT.—Air Vice-Marshal J. G. Davis, A.O.C. No. 1 Group, visited the Avro factory at Woodford last week to see Blue Steel in production. Here he is with Mr. A. Sewart, Avro director and assistant general manager, missiles, (left), and Air Chief Marshal Sir Harry Broadhurst, the company's managing director.

Airline Competition

FROM Major G. Woods-Humphery, in Westport, Connecticut, we have received some interesting comments relating to competitive air operations over the North Atlantic. His remarks were, of course, written before the A.L.T.B. decision regarding the Cunard Eagle application was made known. Major Woods-Humphery, former managing director of Imperial Airways, writes:—

Perhaps one may be permitted to comment on the subject of your article, "The Licensing Act on Trial," in your issue of May 25.

Let me say at once that I am biased, because I am a firm believer in private enterprise and opposed on principle to government ownership or control. I do not deny that there may be acceptable exceptions, but air transport is not one of them. Aside from that bias, I have nothing but praise for B.O.A.C.'s effort in spite of government control.

When we come to the Atlantic case, *per se*, surely exception must be taken to the allegation that Cunard Eagle is seeking to skim the cream off B.O.A.C.'s traffic. Surely the steamship companies *had* all the traffic until the airline started to skim off the cream and then drink the milk—and using substantial subsidies to enable them to do so.

Imperial Airways cultivated the idea of partnerships with

MAIDEN FLIGHT.—The new Aviation Traders ATL-98 Carvair vehicle-ferry in the air on its maiden flight from Southend Airport on Jne. 22. More details are on this page and an article is on pages 749-752.

FOR RESEARCH.—As recorded on this page a pair of radio telescopes has been installed by the Royal Radar Establishment at Defford, near Malvern, to form a radio telescope interferometer for astronomical and other upper atmosphere research.

the shipping companies—the mutual advantages being obvious. Elder Dempster was a partner in the development of services in and to West Africa; the railways of Great Britain were partners in a separate company, Railway Air Services; and the Southern Railway and the Orient Line were stockholders in Imperial Airways.

On the Atlantic, an inter-governmental agreement in 1935 provided for a separate Atlantic company in which Imperial Airways would hold 51%, and companies nominated by Canada and Ireland respectively would take the remaining 49% between them. Although planned in 1935, this company—Imperial Airways (Atlantic), Ltd.—was not actually incorporated until 1937. Under an agreement reached between Sir Eric Geddes and Sir Percy Bates, Cunard was to take approximately half of Imperial Airways' interest in this company, and it was contemplated that the Canadian Pacific Railway would take the Canadian portion, and was therefore closely in the picture.

Rather than that Cunard is muscling-in on traffic that B.O.A.C. has spent millions in developing, surely B.O.A.C. and other airlines have muscled-in on traffic that the Cunard and other shipping companies have spent millions in developing over a century or more. It is fair to say that the airlines, by reason of their speed, have created a new traffic which could not be reached by the shipping companies—but it is low-fare stuff.

The fact remains that Cunard had a position on the Atlantic air services 25 years ago, and was literally pushed out, along with Elder Dempster, the Southern Railway, *et al.*, by Lord Reith's government-corporation mania, which wrecked the entire long-term planning of Imperial Airways, and at the same time dealt an oblique blow to British commercial aeroplane design and construction from which the industry has not yet recovered.

New Space Radars

A NEW installation for the purposes of radio astronomical and upper atmosphere research has been built at the Ministry of Aviation's Royal Radar Establishment at Defford, near Malvern, Worcs. The equipment, which is on the site of a former airfield, consists of two steerable and mobile radio telescopes with parabolic reflectors which can be used either separately or in conjunction with an interferometer. The parabolic reflectors are 82 ft. in diameter and each complete rail-mounted installation weighs 250 tons.

The radio telescopes can be operated over a wide range of wavelengths down to a few centimetres and their spacing can be varied up to about 1,000 metres in any orientation for interferometric observations of high angle resolution. In this rôle, the two antennae are spaced some distance apart and the signals received from them are compared, making it possible to determine the position of a radio source with great accuracy. The aerials can be used both as radiometers for the reception of radio emissions and also with transmitters for radio astronomy.

Asked about the value of the system for detecting ballistic missiles, Dr. W. H. Penley, deputy director of R.R.E., said that at present false alarms were caused by signals from meteors and other phenomena, but observation with the new equipment would identify the signals' source, distinguishing between meteors and missiles. It would also be possible to track Earth-satellites and space-probes.

J. A. D. McCurdy

IT is with great regret that we record the death, on Jne. 25, of Mr. J. A. D. McCurdy who had the distinction of being the first to fly a powered aircraft in the British Commonwealth. After graduating from Toronto University in 1907, he spent two years in close association with Dr. Graham Bell who had earlier been experimenting with kites at Baddeck, Nova Scotia. McCurdy's father had, in fact, been Graham Bell's secretary while these experiments were going on.

When Graham Bell formed the Aerial Experiment Association, J. A. D. McCurdy and a close friend of his, F. W. ("Casey") Baldwin, joined him as engineers. Others in the venture were Glenn Curtiss and Lieutenant T. Selfridge of the U.S. Army.

First aircraft of the A.E.A. to fly was one designed by Selfridge and flown by Casey Baldwin near Hammondsport in the U.S.A. Next came an aircraft designed by Baldwin; the third was designed by Glenn Curtiss and the fourth by John McCurdy. This last-named craft—the Silver Dart—was powered by a 35 h.p. Curtiss engine and was flown by McCurdy himself for 1½ miles at Baddeck Bay on Feb. 24, 1909. It was the first flight of a flying machine in Canada. On the second flight the next day McCurdy remained airborne for 4½ miles and achieved a speed of 40 m.p.h.

John McCurdy's name will long be remembered in the annals of Canadian aviation. And it will live on in the McCurdy Award—the Canadian Aeronautical Institute's premier award given annually for outstanding technical aviation achievement in Canada.

Sputniks in London

FULL-SIZE reproductions of Soviet Sputniks and space probes will be on view in London for the first time at the Soviet Trade and Industry Exhibition which is being held at Earls Court from Jly. 7 to Jly. 29. Exhibits will include replicas of three Sputniks; the last stage of the rocket that launched Lunik I into orbit around the Sun; and actual recovered head sections of geophysical rockets.

In addition there will be a variety of scientific instruments used in Soviet upper atmosphere research, and photographs and short films depicting research carried out with Sputniks and geophysical rockets. Also promised is a "wide range of materials" related to Major Yuri Gagarin's orbital mission in the Vostok spacecraft.

Indian Fighter Flies

SEVERAL flights have now been made with the Hindustan HF.24 fighter, designed by Kurt Tank for the Indian Government. Powered by two 4,850 lb. s.t. Bristol Siddeley Orpheus 703 engines, it has a supersonic performance and is intended for production in the H.A.L. factory at Bangalore, where the engines will also be built under licence.

The HF.24 was publicly demonstrated on Jne. 24, having first flown about a week earlier. These flights followed repairs made after a taxi-ing accident earlier this year.

Bristol's Air Day

LAST Saturday, Jne. 24, the Bristol Air Day was held at Lulsgate Airport—the first public display held at this municipally owned airport since its opening in May, 1957.

In near perfect conditions, after a doubtful start to the day due to persistent low cloud, a large crowd saw one of the largest and most impressive air displays ever seen in the South-west. Items ranged from a gliding display given by Mr. D. W. Corrick in his home-built Skylark 2c, to the highly polished formation aerobatics by No. 92 Squadron's "Blue Diamonds" team.

The Air Day was officially opened by the Lord Mayor of Bristol who arrived from the Bristol City Centre in a Belvedere helicopter flown by Mr. C. T. D. Hosegood, and for the ensuing three hours there was a packed flying programme which included the Bristol Air Race. This was a three-lap short-circuit event (16½ miles each lap) for the Avian Challenge Trophy.

There were 19 entries for this closely handicapped race which was won by Mr. A. J. Spiller in his Proctor 3 at a speed of 140½ m.p.h. Second was the 1955 winner, Mr. R. R. Paine in his Hawk Speed Six at 185½ m.p.h. And in third place was Mr. S. M. Aarons in a Hawk Trainer 3 at 133½ m.p.h.

The Royal Air Force was well represented at the Air Day, with the Central Flying School's Jet Provost aerobatic team led by Flt. Lt. Brambley; a Canberra B(I) 6, Shackleton MR. 3, and Britannia. The U.S.A.F. and U.S.N. gave fly-pasts, and the Army Air Corps showed how adept it is at low flying.

Show stealers, however, were the vintage aircraft—in particular the newly restored Bristol Bulldog, which had only been flown for the "first time" on the previous day. The Bulldog came in for many envious glances from the air race pilots whose aircraft were parked alongside it. The Gladiator and Bristol Fighter from the Shuttleworth Collection were also flown. The accent of the display finally returned to civil flying with a ticker-tape cutting act by Tiger Club Turbulents, and a fly-past of a wide range of business and executive light aircraft.

In a "miniature-Farnborough" ground exhibition the British Aircraft Corporation and Bristol Siddeley Engines showed their exhibits that had been displayed at the Paris Salon, including a model of the Vickers Hovercraft and the Bristol Siddeley Pegasus lift-thrust engine.—P.R.M.

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SPACE DISCUSSED.—M. G. J. Broussard, of the Compagnie Générale de Télegraphie Sans Fil, discusses a new type of navigational satellite at the opening session of the B.I.S. Space Symposium; on his right is the session chairman Dr. Theodore von Kàrmàn.

A City Honour for the R.A.F.

AN aeronautical event of considerable distinction took place in the City last week when the Worshipful Company of Coachmakers and Coach Harness Makers met at dinner in the Tallow Chandlers' Hall to honour the Royal Air Force and to mark the Company's "adoption" of No. 216 Squadron of Transport Command. As the Master—Sir Reginald Verdon Smith—said, this was indeed a quite exceptional occasion.

Among the distinguished company present was the Secretary of State for Air, the Rt. Hon. Julian Amery; the Chief of the Air Staff, Air Chief Marshal Sir Thomas Pike; the Vice-Chief of the Air Staff, Air Chief Marshal Sir Edmund Hudleston; the A.O.C.-in-C. Transport Command, Air Marshal Sir Denis Barnett; the late C.A.S., Marshal of the Royal Air Force, Sir Dermot Boyle; and the Commanding Officer of No. 216 Squadron, Wing Commander N. E. Hoad.

MR. VINCENT ALFORD, a past-Master of the Company, proposed the Toast to the Master and Wardens, about whom he spoke in the warmest of tones. And he took the opportunity to present to the Master, a specially designed and most handsome contemporary silver drinking cup to mark the 40th year of his association with the Coachmakers Company.

SIR REGINALD VERDON SMITH in reply, after thanking Mr. Alford for his most generous gift, referred to certain provocative statements made by the Lord Mayor about Livery Companies. It was not enough, he had said, for them just to be dining clubs and to rest on the laurels of their forefathers. Sir Reginald made it plain that the Coachmakers had long held a similar view; not content with horsedrawn vehicles, they had soon embraced motorcars and, later, aeroplanes.

The Company had developed a close association with the Royal Navy and their adoption of the fleet carrier H.M.S. "Centaur" had been a great success for all concerned. It had, then, seemed that a similar link with the Royal Air Force would be no less successful; and the decision had been taken to adopt an R.A.F. squadron.

So far as selection of the appropriate unit was concerned, he remarked, there could easily have been a certain amount of jockeying for pride of place among those members of the Livery who provide equipment for the R.A.F. However, this problem had been resolved for them by the C.A.S. who selected No. 216 Squadron which had had a continuous record of service since its formation.

SIR AUBREY BURKE, proposing the toast to the Royal Air Force, spoke of the dark days between the fall of France and the Battle of Britain, and of the courage and skill of the R.A.F. "We and the freedom loving countries of the World," he said, "owe this gallant Service a great debt." Sir Aubrey went on to describe in some detail the history and achievements of No. 216 Squadron.

Born 43 years ago, it was an offspring of No. 7 Naval Squadron, and first equipped with H.P. O/400 bombers. It became No. 16 Squadron R.N.A.S. in January, 1918, and on the formation of the Royal Air Force was renumbered 216 and equipped with D.H.10s. In 1919 the Squadron was sent to Egypt and stayed there for 36 years.

During that time, said Sir Aubrey, as a transport squadron it did just about everything: It pioneered the air routes carrying mail and passengers; it was engaged in aerial policing duties, and in supply dropping. In fact the Squadron formed an essential link in the system established for maintaining law and order, encouraging trade and assisting backward countries.

In 1955, No. 216 Squadron returned to England to be re-equipped with Comet 2 turbojet transports and based at Lyneham. Sir Aubrey spoke most warmly of the tremendous contribution the Squadron had made with their work with these aircraft as the high-speed element of Transport Command's operations.

In reply, the Secretary of State for Air, the RT. HON. JULIAN AMERY, said that this adoption of the Squadron was a considerable event. He expressed wholehearted appreciation of the link that had been established between the Worshipful Company of Coachmakers and Coach Harness Makers and the Royal Air Force.

He took the opportunity to reassure his listeners that the future of manned aircraft was by no means over. Indeed, he went beyond aircraft as such and said quite categorically that manned vehicles would still prove decisive in the air "and beyond the air." The future of manned aircraft and, later, of manned spacecraft was, he said, unlimited; while instruments would play an ever-increasing part, the human occupants would continue to be needed.—F.T.M.

Aviation News in General

X-15 RECORD.—Piloted by Maj. R. White, U.S.A.F., the X-15 reached a speed of 3,690 m.p.h. on Jne. 23, beating the previous record of 3,370 m.p.h. set up on May 25. The aircraft's skin temperature recorder logged 750° F.

U.S.A.F. BASES.—Four U.S.A.F. bases in the United Kingdom are to close or lose their operational squadrons within three years. All in central England, Bruntingthorpe is to close next March, and Alconbury, Chelveston and Sculthorpe will be reduced to "weather, communications and support services." By July, 1964, there will be four S.A.C. and four U.S.A.F.E. bases in the U.K.

ITALIAN F-104's.—Lockheed have now signed an agreement with the Italian Government for the establishment of an F-104 Super Starfighter production programme in Italy. Final assembly will be at the Fiat factory in Turin and Alfa Romeo will produce J79s under licence in Milan.

SHIPBORNE HELICOPTERS.—The Royal Canadian Navy's last two Mackenzie-class destroyers, due to be completed in 1963, will be fitted with a built-in hangar for a single anti-submarine helicopter. H.M.C.S. "Provider," a 20,000-ton supply vessel, also under construction, will have accommodation for six Sikorsky HO4S helicopters.

GRUMMAN OVERSEAS.—To look after certain of its interests including those outside the U.S., the Grumman Aircraft Engineering Corpn. has formed Grumman International, Inc. Its European office will be in Paris.

R.C.A.F. CUTDOWN.—Four CF-100 all-weather fighter squadrons of the R.C.A.F.'s Air Defence Command are being disbanded. When the last unit is disbanded, the air defence of the country will be in the hands of five CF-100 squadrons until the two Bomarc B missile bases become operational, probably in 1962.

U.S. ACCIDENTS DOWN.—The U.S. Air Force experienced its safest flying year during 1960, but expects trouble in equalling the record in 1961. Major aircraft accidents per 100,000 flying hours dropped from 8.2 in 1959 to an all-time low of 5.8 in 1960. In-flight collisions dropped from 32 in 1958 and 27 in 1959, to 15 in 1960, an overall reduction of 53%. Most of these were between aircraft flying in formation or on operational rendezvous such as aerial refuelling.

RESEARCH BY BLIMP.—To obtain greater knowledge of low-speed aerodynamics, the U.S. Navy has modified a blimp from which wind-tunnel models are suspended. Conventional wind-tunnels are said to be "too fast" for this kind of research.

GENERAL AVIATION GROWTH.—The business, private and utility aircraft fleet in the United States is expected to reach 100,000 active aircraft by 1970, the Aerospace Industries Association estimates. More than half of them are expected to be used by business. There are now 70,000 aircraft in these same classes.

SIKORSKY PROJECT.—This high-performance helicopter, proposed in a design study submitted by Sikorsky Aircraft to the U.S. Army Transportation Research Command, has the HSS-2 rotor and transmission system with a new low-drag fuselage. Top speed would be 224 m.p.h., payload 7,000 lb. and ferry range 2,400 miles.

MORE THORS.—Douglas have received an order for 22 additional Thor rocket vehicles for use as satellite boosters. These will have a shorter, lighter airframe than the standard missile and will be powered by an uprated Rocketdyne engine of 165,000 lb. s.t.

MIDLANDS HELIPORT.—The first private heliport in the Midlands was inaugurated on Jne. 26 when a Westland Whirlwind helicopter took Mr. D. B. Collett, an executive director of the Dunlop Rubber Co., Ltd., from Battersea Heliport to the company's main U.K. factory at Fort Dunlop, Birmingham. The company does not envisage the operation of a regular scheduled helicopter service between Fort Dunlop and other Dunlop factories in the U.K. But it is anticipated that directors and V.I.P. visitors will use this form of transport as much as possible.

LASA TOURS.—First of a series of demonstration tours by the new Lockheed-Macchi (LASA 60) Santa Maria utility six-seater began on Jne. 20 to Spain and Morocco. Similar demonstration tours to the Middle East and North Africa will be undertaken by Col. Fatigati of Aeronautica Macchi, accompanied by Mr. Douglas Lindsay, during the summer months.

SABRELINER NEWS.—North American has completed delivery of all six NASARR-equipped T-39Bs to Tactical Air Command for use in F-105 Thunderchief crew training. Two T-39As have been delivered to Air Training Command and 86 more are on order. Six T-39s are being used in the flight test programme for F.A.A. certification and U.S.A.F. acceptance, and by the end of May had completed 688 hours in 376 flights.

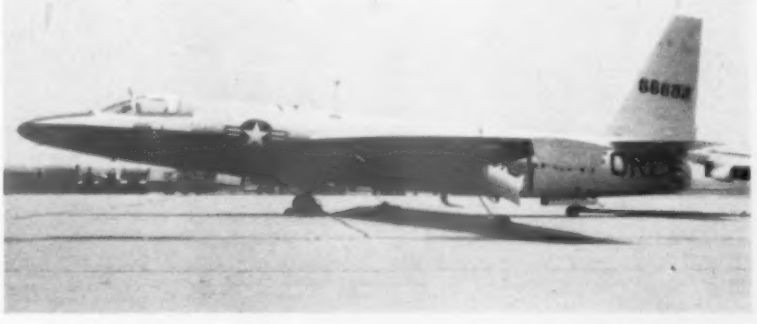
SPACE MAN.—Cdr. Alan B. Shepard made 78 voice communications, monitored 27 major capsule functions, and performed five attitude manoeuvres during his 15 min. 22 sec. ballistic flight on May 5. Next manned Redstone-Mercury firing, scheduled for next month, will place more emphasis on observations by the astronaut.

ANTI-MISSILE.—Nike-Zeus will be launched for the first time in an attempt to intercept an ICBM this autumn. An Atlas will be launched from Vandenberg A.F.B., Calif., to a point south of the Marshall Islands—a distance of about 5,000 miles. The intercepting Nike-Zeus will rise from a site on Kwajalein Atoll.

PICCHIO SALES.—S.I.P.A. and Procaer of Milan have signed an agreement by which S.I.P.A. will take over the French marketing of the four-seat F.15B Picchio. Procaer will represent S.I.P.A. in Italy and will be in charge of Italian sales for the French company's S.272 Presence executive transport.

SWEDISH ROCKETRY.—First of five Arcas sounding rockets made available to Sweden by NASA is expected to be launched in August from the Vidsel site in Lapland. Test will form part of a series of investigations being made by the International Meteorological Institute in Stockholm into noctilucent clouds.

A SPANISH EXECUTIVE.—Designated the Hispano Ha-230 Saeta Voyager, a jet executive monoplane is under development in Spain. It will be powered by two Marboré II, at the wing roots, and will seat four to six people.



NEW U-2.—Latest of the U-2 series—the two-seat Lockheed U-2D was displayed and demonstrated at Wright-Patterson A.F.B. during Armed Forces Day. Colour is light grey with lower half of fuselage and undersurface of wings dull black.

Commercial Aviation Affairs

C.A.B. STUDIES "NO-SHOWS."—The Civil Aeronautics Board is studying the problem of "no-shows"—passengers who make reservations but fail to show up for the flight. It estimates that one out of 10 passengers is in this category. Airlines try to protect themselves by selling more reservations than there are seats available. The $3 penalty against no-shows was dropped some years ago by American carriers due to passenger resentment.

PRESTWICK SERVICE.—Overseas Aviation will start a thrice-weekly service between Gatwick, Manchester and Prestwick on Jly. 31, using Canadair North Stars. Designed to serve Scottish and Midlands businessmen, the flights will leave Prestwick at 9.45 a.m. and Manchester at 10.50 a.m., arriving at Gatwick at 12.20 p.m. The first return flight leaves Gatwick at 6.30 p.m.

NON-STOP TO GHANA.—B.O.A.C. inaugurated the first non-stop service between London and Ghana on Jne. 25, with a scheduled flight time of nine hours by Britannia.

MOSCOW—NEW YORK.—The U.S. Government has proposed that negotiations for a bilateral agreement with Russia should begin on Jly. 18. Both sides have agreed in principle to the talks, which will centre around a Moscow-New York service by Aeroflot and Pan American.

CARIBOU DEMONSTRATION.—Following its appearance at the Paris Aero Show, the Caribou demonstrator CF-LAN was at Hatfield for a week and has now embarked on a month-long tour through 13 countries in Europe, the Middle East and Africa.

DME IN U.S.A.—On Jne. 15 the F.A.A. began using DME on a nation-wide basis, following the completion by American Airlines of a DME installation programme for all its jet aircraft. The F.A.A. requires all turbojet transports to have DME by Jly. 1, 1962, all turboprops by Jan. 1, 1963, all pressurized transports by Jly. 1, 1963, and all other aircraft over 12,500 lb. weight by Jan. 1, 1964.

JERSEY TO SCOTLAND?—Among the recent licence applications to the ATLB is one from Jersey Airlines for the route Jersey or Guernsey—Bournemouth (opt.) — Southampton (opt.) — Glasgow (Renfrew) and/or Edinburgh.

707 RECORDS.—A total of 116 domestic and 270 international point-to-point speed and distance records for airliners are held by Boeing 707s and 720s. Notable among them are a ground speed of 805 m.p.h. between Kansas City and Chicago, a time of 3 hr. 52 min. from Los Angeles to New York and a non-stop scheduled operation from New York to Rio de Janeiro (4,972 st. miles) in 8 hr. 48 min.

DECCA FOR INDONESIA.—For use by the meteorological department in Djakarta, the Indonesian Government has ordered Decca WF2 wind-finding radar.

EL AL NON-STOP.—One El Al service a week between New York and Tel Aviv is now scheduled non-stop, using Boeing 707-420s. The first service was completed in 9 hr. 33 min. El Al has taken delivery of its first 707, which has replaced the aircraft chartered from Varig since the start of the year. A non-stop Tel Aviv-London service will start next month.

ELECTRAS OFFERED.—Lockheed Electras are offered on the second-hand market for the first time in the Aircraft Exchange Market Report for Jne. 22. Three aircraft of this type, fully modified, are offered for sale at the end of this year at $3 million each. Several U.S. operators of Electras have recently been reported considering the sale of some of their fleet, and American Airlines has already disposed of three.

EUROPEAN TRAFFIC.—ARB statistics for 12 European carriers show that their inter-European traffic in May increased by 15% over May, 1960, while capacity went up by 21%. For the year ended Apr. 30, 1961, there were increases of 19% and 18% respectively in seat miles and passenger miles.

UNITED CARAVELLES.—The first Caravelle VIR for United Air Lines was handed over at Toulouse on Jne. 12, when it was christened the "Ville de Toulouse." The first two United Caravelles have completed over 100 hours. Scheduled services will begin on Jly. 14.

B.K.S. VISCOUNT.—Latest British independent to operate Viscounts is B.K.S., using an aircraft chartered from Maitland Drewery. Other independent Viscount users are Starways, Tradair, B.U.A. and Cunard Eagle.

I.C.A.O. COUNCIL.—Membership of the I.C.A.O. Council will be increased from 21 to 27 states if a recommendation of the Council is ratified by two-thirds of I.C.A.O.'s members. The Council has comprised 21 members since I.C.A.O. was founded in 1947 with a membership of 26 states. There are now 86 member states.

I.C.A.O. MEMBERS.—The Republics of Dahomey and Niger became members of I.C.A.O. on Jne. 28.

TRANSPORT COURSES.—The City of London College in Moorgate, E.C.2, runs a number of courses of air transport interest as part of a full course in preparation for the Institute of Transport examination. They comprise: Law of Air Transport (Monday evenings, 7-8 p.m. first year, 6-7 p.m. second year). Economics of Air Transport (Tuesdays, 7-9 p.m.) and Air Transport Operation (Thursdays, 7-9 p.m.). Enrolment for the next course will be on Sept. 19-20 from 5-7 p.m.

News About People

T.A.A. IN LONDON.—Mr. J. B. Gray Hulton has been appointed U.K. sales manager for Trans-Australia Airlines and will take up his position on May 1. He has been with T.A.A. since its formation in 1947, and for the past few years has been traffic and sales superintendent, Tasmania.

SALES APPRENTICESHIPS.—B.O.A.C. is inviting applications for a number of sales apprenticeships from boys between 17 and 18 with four G.C.E. O-level passes including English and one foreign language. There is no premium to pay and the course will last three years, after which the apprentices will join the passenger reservation department.

MET. AWARDS.—Capt. E. H. Jones (B.O.A.C.) and Capt. A. L. French (B.E.A.) are the recipients of the 1961 Meteorological Office Awards for outstanding service in providing weather reports. They will be presented with briefcases on Jly. 4. Awards of books are being made to five B.E.A., two B.O.A.C. and one B.U.A. captains, and to seven B.O.A.C. navigators for providing the best series of met. reports in 1960/61.

QANTAS DEPUTY.—Capt. R. J. Ritchie has been appointed deputy chief executive and deputy general manager of Qantas, in succession to Capt. George Allen. He has been with the company since 1943 and became assistant operations manager in 1949.

CHANGES AT ULTRA.—Recent appointments by Ultra Electronics, Ltd., are Mr. E. B. Augood as works manager and Mr. R. G. Mammatt as projects officer, control and instrumentation division.

I.A.N. COUNCIL.—At the 11th annual convention of the International Airline Navigators Council in New York, Mr. V. R. Pitcher was elected executive secretary and Mr. F. S. Tanner executive treasurer. Both are senior navigators with B.O.A.C.

T.W.A. CARGO SALES.—Dr. P. G. Yovanovitch has been appointed regional director of cargo sales for T.W.A. in Paris. He has been with the company since 1946 and has served in Geneva and Israel.

READING PRIZEWINNERS.—At the Handley Page (Reading), Ltd., annual apprentice prizegiving on Jne. 2 engineer apprentices who received awards were B. A. Godley, K. Brown, A. C. Robinson, R. King and T. W. Tutt. Five trade apprentices also received prizes. These were P. Vince, D. Guest, S. Bryan, B. Leeming and R. Screen.

GENERAL SALES.—Mr. T. Blyth, formerly with S. N. Bridges and Co., Ltd., has joined Aircraft-Marine Products (G.B.), Ltd., as the company's general sales manager.

SIMON APPOINTMENTS.—Mr. A. A. Haining and Mr. H. Powell have joined Simon Equipment, Ltd., as sales and production managers respectively.

Air Transport

Second U.K. Atlantic Carrier?

ON the day after last week's start of the major European and domestic route hearings, the Air Transport Licensing Board announced its decision on the Cunard Eagle North Atlantic applications. As had seemed likely, approval was given for a daily service between the U.K. and the U.S. East Coast, but not for the proposed services to Canada or to the Mid-west (Chicago) area. The board's decision was given only three weeks after the conclusion of the hearings.

Unless B.O.A.C. is successful in its appeal—which will, if lodged within 21 days, be heard by the commissioner appointed by the Minister of Aviation—Cunard Eagle plan to start operations with Boeing 707/465s in May, 1962.

The approved route is described as being primarily between London and New York, with optional traffic stops at Manchester, Prestwick, Philadelphia, Boston, Baltimore and Washington, on a once-daily return schedule with passengers and supplementary freight. The licence will be valid for 15 years from Aug. 1, 1961.

The board, giving its reasons for the decision, commented to the effect that future North Atlantic traffic growth had been variously estimated, but that it could scarcely be put at less than 15%, nor at much more than 20% per year on the average. Having regard to the volume of U.S. East Coast traffic and its rate of growth the board did not think that a licence to a second British operator, in the terms granted, would cause "wasteful duplication."

On the other hand the board did not think that the U.S. mid-west route could economically support two operators and a licence for a second British operator to Canada would lead to both "wasteful duplication" and "material diversion." In practical terms the growth of traffic would apply primarily to the U.K.-New York route; the traffic between the U.K. and the other approved points on the East Coast was relatively small, but these places were within the same traffic area and had, therefore, been included as optional stops.

The board believed there would be diversion, and probably "material" diversion, of traffic from B.O.A.C., in the sense that the new service, if successful, would carry traffic which the corporation might otherwise have carried. Nevertheless, this prospect was not one which was necessarily a bar to the granting of a licence. To have accepted this as a bar would have been to preclude the grant to any operator of a licence on any route served by another U.K. operator, thus "freezing" the existing situation—a result which the board could not believe to have been the intention of the Licensing Act.

The effect of this diversion would progressively and rapidly diminish as traffic increased and there was little doubt that the absolute amount of traffic carried by the two British operators would be more than that which would have been carried by one only.

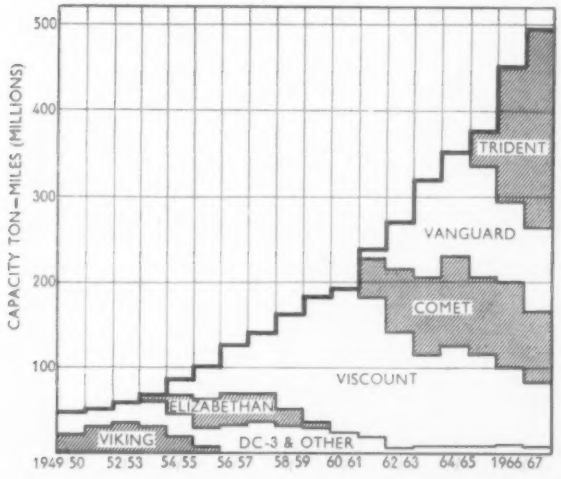
B.O.A.C.'s statement on the decision included the comment that if the board's decision accepted, as it appeared to accept, the inevitability of "material diversion," then the corporation's position on the North Atlantic would be "undermined"—which was contrary, in B.O.A.C. understanding, to the intention of Parliament as embodied in the Licensing Act.

The Struggle for European Rights

TO the onlooker, the most significant feature of the last week's initial hearings by the A.T.L.B. of major applications for European traffic rights was the prevailing overall air of sweet reasonableness on every side. After the sometimes acerbic and occasionally even acrimonious exchanges during the North Atlantic hearings, it was pleasant to listen to the objective, calmly reasoned and sometimes even humorous statements by, for instance, British United Airway's principal representative.

In this series of meetings—which continue today, and tomorrow, Jne. 29-30—71 applications for U.K., Europe and domestic services (and objections from all and sundry) are being considered by the board. Last week's two-day sessions were devoted to general statements from four of the applicants (B.E.A., B.U.A., Cunard Eagle and Tradair) and to the initial examination of two of the protagonists' principal witnesses.

The basic questions were whether the traffic growth justified "dual participation" and whether competitive operations by U.K. carriers in addition to B.E.A. would result in a better service to the customers. Bedevilling the answers to these questions were the inter-governmental bilateral and interline pooling agreements.



B.E.A. CAPACITY.—Planned growth of B.E.A.'s capacity ton-miles up to Mar. 31, 1967, is shown in this diagram, which formed part of the corporation's submission at the major A.T.L.B. hearing last week.

Broadly, the case for B.E.A.—which, with only four route applications, was appearing primarily as an objector—was to the effect that the corporation had built up a highly successful business over a period of 15 years, and that it could "do a better job than any other applicant."

The case for the independents, headed by British United, was to the effect that B.E.A. could now stand a reasonable amount of competition; that there was a large untapped market waiting for lower fares; and that controlled competition—from airlines which had already shown their ability to find and to exploit traffic markets—would (in the words of the Licensing Act) "further the development of British civil aviation." An incidental, but important point made by B.U.A. was that, by operating out of Gatwick, it would be drawing on a geographical source of traffic which might previously have found surface transport to some Continental destinations more convenient.

Among the many points made by the independent carriers was that stability in business and planning was possible only with scheduled operations and that all licences should be for reasonably long and specifically stated periods of validity.

In its own way, the most impressive general case was that made by Tradair, whose representative showed that its plans (including those for scheduled services available only to block bookings by British inclusive tour operators) were "competitive" in terms only of new ideas for traffic development. He quoted from the 1959-60 A.T.A.C. report, in which Tradair had been mentioned as showing "a realistic appreciation of the requirement that new services should develop genuinely fresh traffic markets rather than compete for traffic which is adequately catered for by established services."

Blind Landing in France

SUD-AVIATION has entered into an agreement with Lear Incorporated for the joint development and flight testing of a blind landing system based on the Lear L 102B autopilot. A Caravelle is to be equipped and will be test-flown at Toulouse. Lear has been making flight tests for some time past at Santa Monica with components of the blind-landing system mounted in a Douglas B-26.

The first objective of the trials, say Sud, will be to lower the weather minima for landing, with a view to achieving full automatic landings in due course. The Lear L 102 autopilot is standard equipment in the Caravelle. Also collaborating in the development programme is the French SFENA company.

Air Transport . . . .

B.U.A.'s Town Terminal

BY the summer of 1962, British United Airways hopes to have a new town terminal in use at Victoria Railway Station. Plans for the erection of a terminal over the railway tracks at Victoria have been agreed between B.U.A. and British Railways.

The plan is linked with B.U.A.'s growing use of London (Gatwick) for its domestic and international flights, including any approved by the A.T.L.B. following the series of hearings begun last week. The terminal will be reached from ground level by escalators and will be connected, on the departure side, to the station platforms by stairways providing direct access to trains to Gatwick.

This is described as the "second co-operative venture between British United Airways and British Railways." The first is the rail-air-rail services provided by Eastern Region of British Railways, Channel Air Bridge and Belgian National Railways.

K.L.M. in a Crossfire

BOTH T.W.A. and Pan American have filed formal complaints with the C.A.B. over K.L.M.'s alleged violation of its foreign air carrier permit. The basis of the complaint is that K.L.M. is offering more capacity on its North Atlantic routes than is necessary for the traffic offering between the Netherlands and the U.S., and that the services are being operated "primarily for . . . traffic between the U.S. and countries other than the Netherlands"—traffic which T.W.A. and Pan American regard as rightfully theirs.

The Board's powers, the petitioners claim, "should be exercised with respect to the excessive schedules and capacity operated by K.L.M." The protest was made while the Dutch and U.S. delegation in Washington were apparently deadlocked in their negotiations over the K.L.M. request for an Arctic route to Los Angeles. As we noted in our issue for Apr. 27, these talks have been resumed largely at the instigation of President Kennedy, and the major point at issue is the Dutch willingness or otherwise to provide the C.A.B. with traffic statistics and to accept capacity restrictions.

The difficulties in which K.L.M. finds itself in both these matters are symptoms of a much deeper rift between the U.S. and European airlines over the interpretation of the 1946 Bermuda Agreement. As is well known, this agreement, which is the basis of most existing bilaterals between the U.S. and foreign governments, made no specific allowance for capacity restrictions, but said there should be "fair and equal opportunity for the carriers of two nations to operate any route between their respective territories covered by the agreement. . . ."

The massive build up of capacity over the North Atlantic resulting from the introduction of the big jets, coupled with the decline in traffic growth this year (see our previous issue), has brought the matter to a head. Under pressure from the U.S. airlines, and particularly T.W.A. and Pan American, C.A.B.'s first action was to draft regulations requiring foreign carriers to file details of schedules and traffic (see issue for Mar. 17).

Foreign airlines, chiefly European, have responded by accusing the U.S. of an about-face over the interpretation of the Bermuda Agreement. It was the U.S., they point out, that stood firm for a non-restrictionist policy, first at Chicago in 1944 and then at Bermuda; the capacity-restricting interpretation now being put forward is, it is claimed, contrary to that intended by the drafters of the agreement.

The Eastern Shuttle

SINCE its inception on Apr. 30, Eastern Air Lines' experimental air shuttle service on the New York-Boston and New York-Washington routes has aroused a great deal of interest. The service is a no-reservation, pay-on-board one, with transport guaranteed to any passenger who arrives before departure time. The aircraft used are fully depreciated, 95-seat Super Constellations—and Eastern has already made good its guarantee by putting on two aeroplanes when 96 passengers turned up for one flight.

There are eight round trips a day (four on Saturdays, six on Sundays) on each of the two services, with departure in all cases on the "even" hours from 08.00 to 22.00. No seats can be reserved in advance. As passengers enter the terminal building (the New York terminal for the service is La Guardia, where Eastern opened new facilities in a converted hangar on Jne. 12), they collect a boarding pass from an automatic dispenser and place their luggage (if any) on a small trolley of the kind widely used in American self-service stores.

Baggage is weighed at the departure gate, where 50 cents is charged for each 10 lb. over the 40 lb. free limit. Tickets are purchased on the aircraft—$12 for New York-Boston and $14 for New York-Washington, or about 27% below the regular first-class fares. Payment can be made by cash or cheque, or an air travel credit card can be used. Two aircraft are assigned to each service, and stand-by at the gate until departure time.

Eastern Air Lines' assistant vice-president, Mr. Frank Sharpe, said recently that the service can break even at a 50% load factor. From Apr. 30 to the beginning of June, more than 35,000 passengers had been carried, which seems to represent a load factor of something under 40%.

FREIGHTERS DELIVERED.—The first Canadair Forty-Four swing-tail freighter was delivered to Flying Tiger Line (left) earlier this month and is now at the company's base at Burbank, California. On Jne. 20, the first Forty-Four for Seaboard World Airlines (above) was handed over at Montreal.

We're flying the Atlantic . . . supersonic . . . *in a flask*

Not long ago the problem in jetliners was to prevent fuel from freezing. Shell research found the answer—the first low-freeze-point kerosine.

Now, with supersonic flight, the problem is heat. High temperatures in supersonic airframes, due to kinetic heating, affect the stability of conventional fuels.

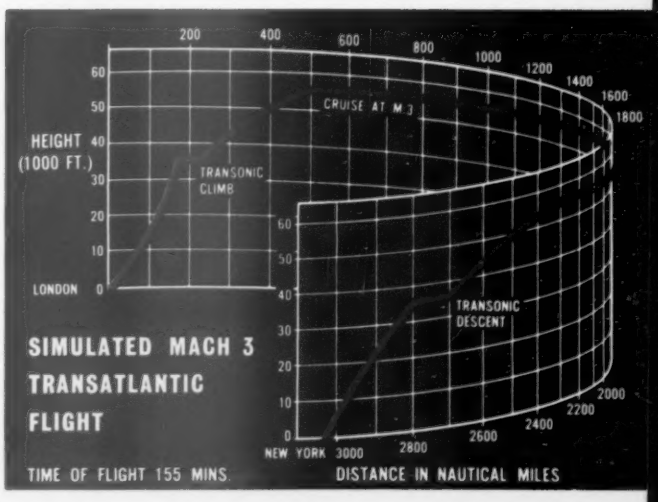
In seeking an answer, Shell scientists simulate in a glass flask the atmospheric and temperature conditions which fuels would experience in supersonic flight. The effects are then measured by standard methods. Samples of metals used in aircraft fuel systems can be introduced to see how they influence the thermal stability of the fuel.

Research such as this is essential to the development of an economic fuel for supersonic flight.

YOU CAN BE SURE OF

SHELL

AVIATION SERVICE



MARCONI DOPPLER

IN THE ARGOSY C Mk.1

The *Armstrong Whitworth Argosy C Mk. 1 for the Royal Air Force Transport Command will be fitted with Marconi AD2300B Doppler Navigator and Track Guide Computer.

** They will also be fitted with the Marconi AD712 Automatic Direction Finder.*

MARCONI

AIRPORT AND AIRCRAFT RADIO SYSTEMS

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A7

The Fighting Services

Non-Stop to Australia

THE Vulcan B.1 of No. 617 Squadron (Wg. Cdr. L. G. A. Bastard) which last week made the first non-stop flight from the United Kingdom to Australia in 20 hr. 3 min., covered an indirect route of 11,500 statute miles at an average speed of 575 m.p.h. Piloted by Sqn. Ldr. M. G. Beavis, the V-bomber took-off from its base at R.A.F. Scampton at 11.35 hrs. on Jne. 20 and was over Sidney at 07.38 hrs. (B.S.T.) the following morning. It landed at R.A.A.F. Richmond, where the crew was met by Air Marshal Sir Kenneth Cross, A.O.C.-in-C., Bomber Command.

Flying by way of France, Italy, Greece, Cyprus, Turkey, Iran, Pakistan, India, Malaya, Indonesia and the Timor Sea, the Vulcan was refuelled in flight three times (once at night and twice in daylight) by Valiant tankers of No. 214 Squadron (Wg. Cdr. P. G. Hill) operating from Akrotiri, Karachi and Singapore. The majority of the flight was made at 40,000 ft. and the fastest section was over Australia, east of Alice Springs, where the average speed was approximately 700 m.p.h. Flight refuelling, taking on 5,000 gal. in 12 min., was made at 400 knots.

Last April, Sqn. Ldr. Beavis and his crew—Flt. Lt. D. Bromley, co-pilot; Flt. Lt. G. Jukes, nav./plotter; Flt. Lt. R. C. Taylor, nav./radar; Flg. Off. J. F. Knight, A.E.O./signaller; and Ch. Tech. W. McAlpine, crew chief—won the annual Bomber Command award for the best crew in bombing and navigation. Their previous long-distance non-stop flights have been to Nairobi, Gan and Karachi. The Karachi flight, also in April, was a non-stop round trip of 9,450 statute miles which was completed in 17 hr. 28 min.—an average speed of 565 m.p.h.

Visiting North America

LED by the A.O.C.-in-C., Flying Training Command, Air Marshal Sir Hugh Constantine, staff and students of No. 19 Specialist Navigation Course at the R.A.F. Flying College, Manby, left the U.K. last week for this year's annual visit to the R.C.A.F. and the U.S.A.F.

Accompanied by the Commandant, Air Cdre. D. G. Smallwood, and by officers from the Air Ministry, No. 25 Group and the A. and A.E.E., the party flew out in a Comet of No. 216 Squadron. They are planning to visit R.C.A.F. Headquarters in Ottawa and R.C.A.F. Winnipeg, and U.S.A.F. bases at Mather, Wright Patterson and Eglin before returning to this country via Bermuda on Jly. 7.

Lord Trenchard Memorial

A MEMORIAL statue to Marshal of the R.A.F. Viscount Trenchard, in the Victoria Embankment Gardens near the Air Ministry, will be unveiled at noon on Wednesday, Jly. 19, by the Prime Minister. The Archbishop of Canterbury will dedicate the statue.

The Queen's Colour for the R.A.F. in the United Kingdom will be paraded for the ceremony and the massed bands of the R.A.F., detachments of all three Services and of the Metropolitan Police will be on parade, together with standard-bearers of the R.A.F. Association.

Pakistan Lecture Visit

TWO officers, Wg. Cdr. R. Aytoun and Wg. Cdr. K. Hellawell, from the Central Fighter Establishment and Wg. Cdr. I. S. Stockwell from Headquarters, Fighter Command, are to make the third annual lecture visit to the Pakistan Air Force Staff College at Karachi next month.

Flying out at the invitation of the P.A.F. on Jly. 8, the three officers will lecture on air defence, fighter operations and surface-to-air weapon systems. They are due to return to the United Kingdom on Jly. 16.

Flying Training Command Appointments

AIR VICE-MARSHAL G. A. WALKER, C.B., C.B.E., D.S.O., D.F.C., A.F.C., is to become A.O.C.-in-C., Flying Training Command, in September, with the acting rank of Air Marshal. He will succeed Air Marshal Sir Hugh Constantine, K.B.E., C.B., D.S.O., whose appointment as Commandant of the Imperial Defence College was announced in our issue of Jne. 15.

Chief Information Officer at the Air Ministry since June, 1959, Air Vice-Marshal Walker was previously A.O.C., No. 1 Group, Bomber Command. From 1954 to 1956 he was Commandant of the R.A.F. Flying College.

Gp. Capt. V. C. Otter, O.B.E., has become Senior Technical Staff Officer at Flying Training Command, with the acting rank of Air Commodore. Commanding No. 32 Maintenance Unit at R.A.F. St. Athan prior to his new appointment, he was Command Engineer Officer, Bomber Command, from 1956 to 1959. Between 1955 and 1956 he was Senior Technical Officer at R.A.F. Wildenrath, Germany.

CANADIAN HILLERS.—Twenty-four Hiller 12Es have been ordered by the Canadian Government for use by the R.C.A.F. and the Canadian Army. Designated CH-112s, three of the helicopters are for the R.C.A.F. which will initially employ them for pilot training.

Caribbean Goodwill Tour

THREE Shackletons of No. 224 Squadron from Gibraltar are at present making a two-week tour of the Caribbean. Going to Jamaica, British Honduras and Trinidad by way of the Azores and Bermuda, the three aircraft will fly from Jamaica to Caracas on Jly. 4 with the Band of the 1st Battalion of the Royal Hampshire Regiment, who are among the British contingent attending the Venezuelan independence celebrations there on Jly. 5.

The R.A.F. force commander is Air Cdre. J. N. H. Pike, A.O.C., Air Headquarters, Gibraltar, and the No. 224 Squadron detachment is commanded by the C.O., Wg. Cdr. J. G. Duncan.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Off. B. G. Martin, O.B.E., W.R.A.F., to the Department of the Air Member for Personnel; Wg. Cdr. M. L. L. Bathe, Wg. Cdr. I. J. De la Plain and Wg. Cdr. P. J. Dunlop to the Department of the Air Member for Supply and Organization.

Bomber Command: Gp. Capt. W. C. Baird, M.R.C.S., L.R.C.P., to R.A.F. Hospital, Nocton Hall, to command the Medical Division.

Fighter Command: Sqn. Ldr. N. S. Howlett to R.A.F. Coltishall to command the Flying Wing, with acting rank of Wg. Cdr.

Coastal Command: Wg. Cdr. J. R. Saunders to the Joint Anti-Submarine School, Londonderry, as Deputy Director.

Technical Training Command: Gp. Capt. M. M. Gardham to Headquarters as Gp. Capt., Organization; Wg. Cdr. A. H. Wilkes, O.B.E., to Headquarters, No. 24 Group, as Senior Officer, Administration, with acting rank of Group Captain.

Signals Command: Wg. Cdr. J. Staff-Brett to the Radio Engineering Unit, Henlow, for staff duties.

R.A.F. Germany: Gp. Capt. P. A. Wilkinson, M.R.C.S., L.R.C.P., to the R.A.F. Hospital, Wegberg, to command.

Near East Air Force (Cyprus): Wg. Cdr. J. S. Higgins, D.F.C., A.F.C., to R.A.F. Pergamos, to command.

Air Forces Middle East (Aden): Wg. Cdr. J. M. Howard to Headquarters as Command Movements Officer; Sqn. Ldr. A. H. Turner, A.F.C., to Headquarters, Persion Gulf, as Wing Commander, Operations, with acting rank of Wing Commander.

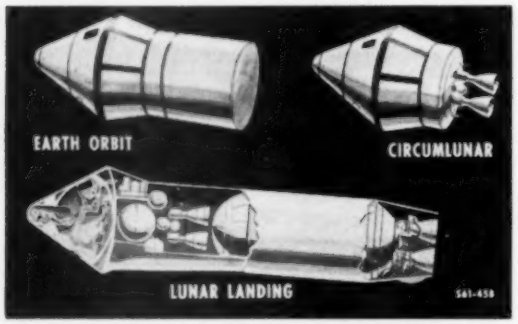
Other Appointments: Gp. Capt. A. C. Brown, D.S.O., O.B.E., D.F.C., and Wg. Cdr. J. M. S. Adams, M.A., to the British Defence Staff, Washington; Wg. Cdr. R. Seidelin, M.A., D.M., B.Ch., M.R.C.P., to the Central Medical Establishment as medical specialist; Wg. Cdr. E. D. Green to Allied Air Forces Northern Europe, as executive to the Chief of Staff.

The Apollo Project

Last month, the American President asked Congress to approve a project which would enable the United States to land men on the Moon by the end of the present decade. How this mission could be accomplished has been the subject of detailed studies by the National Aeronautics and Space Administration under Project Apollo. Some of their initial findings are described and illustrated in this article.

PRESIDENT KENNEDY'S decision to accelerate and expand the United States programme of big booster development, in a bid to send an American expedition to the Moon before the Russians, has focused increasing attention upon the design studies which NASA has been making during the past several months as part of the Apollo programme.

There are now to be three separate missions for spacecraft developed under this general heading. First it is planned to establish 15,000-20,000-lb. vehicles in orbit around the Earth as a means of testing and evaluating components and sub-systems in a space environment. They will also be used as manned laboratories for conducting scientific and technological studies, and also for the purposes of astronaut training.



Three basic Apollo configurations: the Earth-orbiting space-laboratory, Apollo A; the circumlunar spacecraft, Apollo B; and the lunar landing vehicle.

Next will come the Apollo circumlunar vehicle, capable of taking three men around the Moon and back to Earth. And finally there will be a manned vehicle able both to land on the Moon and return a portion of itself to Earth. This last vehicle may have an initial mass of some 150,000 lb.

The Boosters

As arrangements stand at present, Saturn C-1 will be used to launch the Apollo A command centre, together with its propulsion and laboratory units, into an orbit between 150 and 300 miles above the Earth. Recently the third stage of this vehicle (the Convair S-V) has been eliminated from the initial 10-vehicle test programme and it may well be that all Apollo A vehicles will be launched by two-stage Saturns.

NASA has stated that, despite the elimination of the third stage, the booster will still be capable of orbiting payloads of up to about 20,000 lb. because of two modifications which have recently been approved for the basic vehicle. The first of these is the decision to incorporate six Pratt & Whitney LR-115 liquid hydrogen/liquid oxygen engines of 15,000 lb. s.t. in the second stage instead of the four previously specified; the second is a change to be introduced in the seventh and subsequent Saturn first stages which will permit them to embody more propellent.

Alterations have also been made in the booster arrangements for Apollo B. For the circumlunar mission, it was originally proposed to use the four-stage Saturn C-2. This has now been superseded by the newly conceived Saturn C-3 which is to have two of the huge Rocketdyne F-1 engines of 1.5m. lb. s.t. in its first stage.

Stages two and three—fuelled with liquid hydrogen and liquid oxygen—will have four Rocketdyne J-2 engines of 200,000 lb. s.t. and six Pratt & Whitney LR-115s respectively. The reason for the change is that the C-2 version was considered to have "marginal" performance for the circumlunar Apollo mission.

A still larger multi-stage booster will be required for the Moon-landing mission. The design of this vehicle will not finally be sealed until comparative studies have been made between the rival claims of the manufacturers of liquid and solid rocket engines. Nova—as the concept is called—will employ either a cluster of Rocketdyne F-1 engines (giving a total thrust of perhaps 12m. lb.), or a cluster of large segmented solid rockets of similar rating.

Whatever may be the outcome of these deliberations, the

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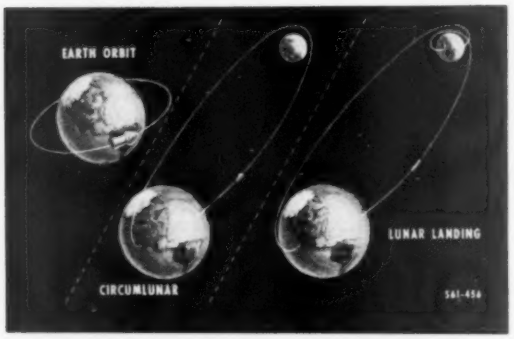
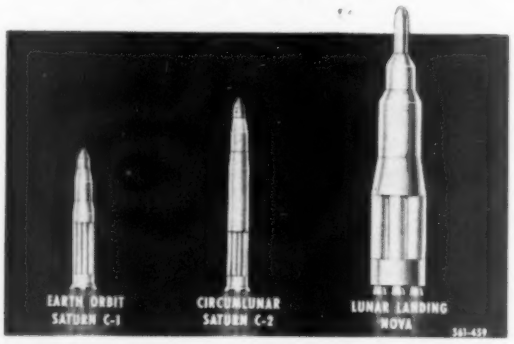
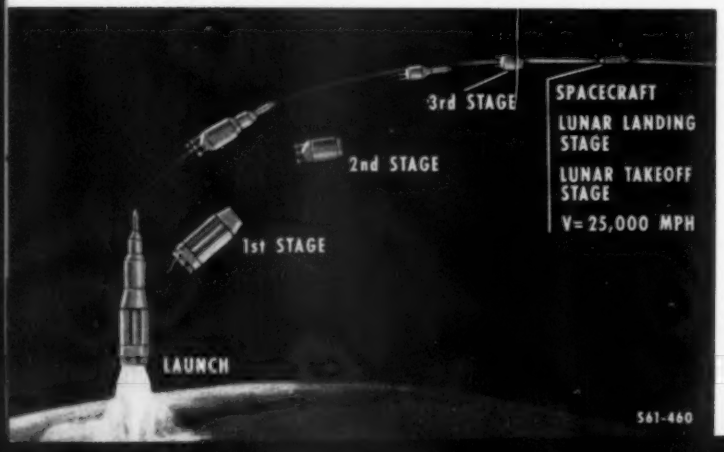


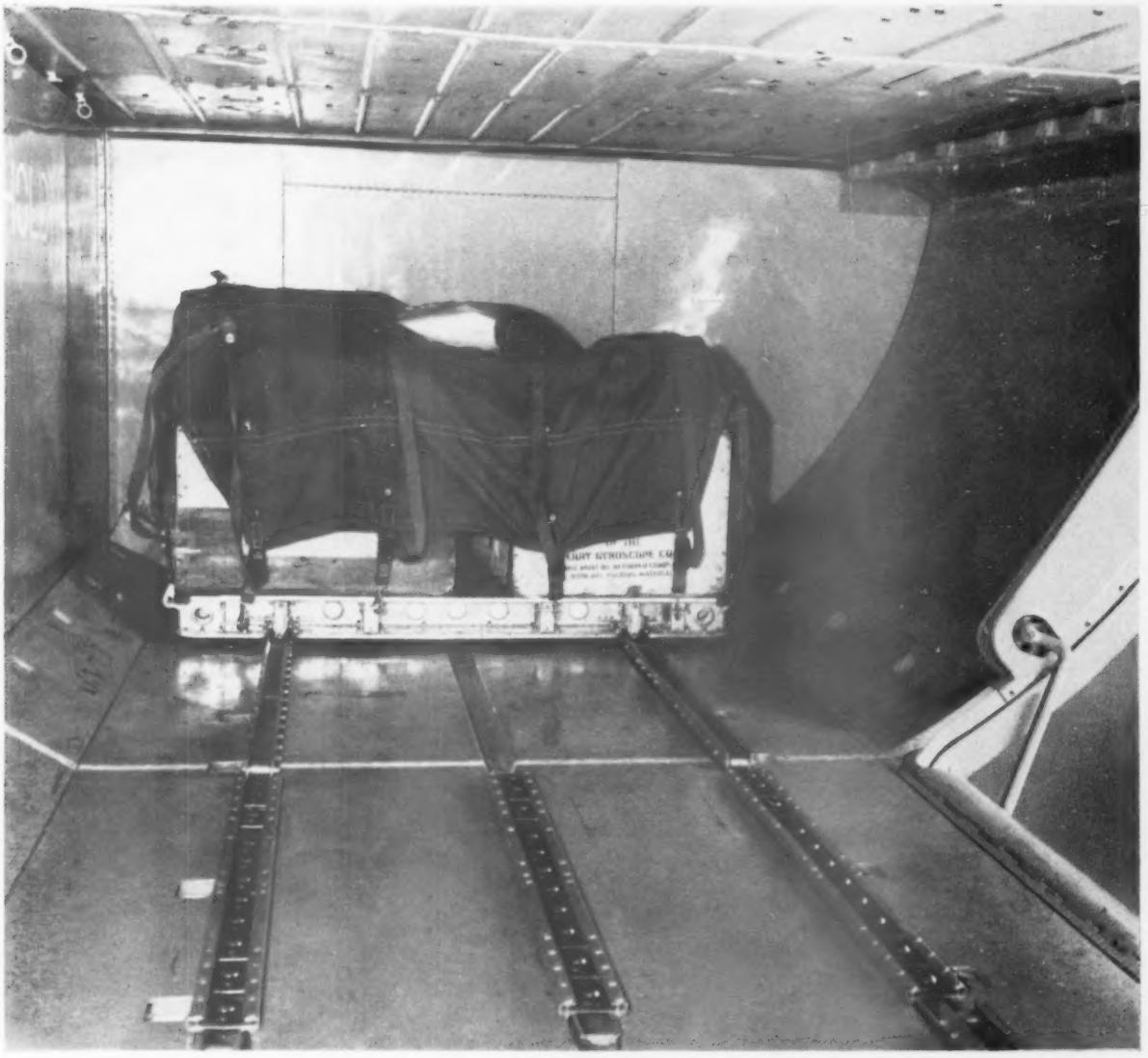
Above, the three basic Apollo missions.



Above, launching vehicles for the Apollo programme are illustrated in this NASA diagram although, as explained in the text, the newly conceived Saturn C-3 is now scheduled to replace the C-2 version for the circumlunar mission.



Left, proposed booster sequence for the Apollo Moon-landing project.



The Vickers Vanguard installation manufactured by Blackburns to B.E.A.'s requirements

Blackburn Pallet-Loading Systems

In addition to airborne parachutable equipment, Blackburns have designed and manufactured pallet-loading systems for commercial aircraft.

Operators of commercial and military aircraft are invited to consult the Blackburn design team regarding role equipment for all purposes.

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(*Continued from page 746*)

upper stages are likely to employ high-energy liquid propellents, both to take advantage of higher specific impulse available with "liquids" and to obtain maximum profit from their use in the favourable conditions of high speed and high altitude launching. Due consideration, however, will have to be given to the storage properties of the propellents used in the return vehicles which will have to remain in usable condition for several days at least.

Lunar Landing

Several techniques are being investigated to determine the most favourable solution to the Moon landing and take-off problems and a good deal of preliminary work will obviously have to be accomplished with remote-controlled, or wholly automatic, unmanned soft-landing spacecraft. Apart from the classical method of alighting tail-first using reverse-thrust rocket braking and landing legs, NASA has been looking into the possibility of a horizontal approach making use of a secondary supporting rocket engine in conjunction with the main engine units for reducing rate of descent.

In this system, the space-vehicle follows more closely the techniques being evolved for VTOL jet-aircraft, and is provided with a three-point undercarriage consisting of nose skis and a tail "bumper." Engine thrusts to support a given payload, and permit a certain amount of surface hovering, are comparatively small because of the Moon's reduced gravitation: about $\frac{1}{6}$ that of the Earth.

Part of the same proposal is that the take-off from the Moon's surface would be made using the main landing stage as a launching device. This would enable the return vehicle, with its crew, to leave the airless Moon at a low inclination to the surface resulting in minimal *g* losses.

It is acknowledged that such take-off procedures will require major advances over the operational techniques in use today,

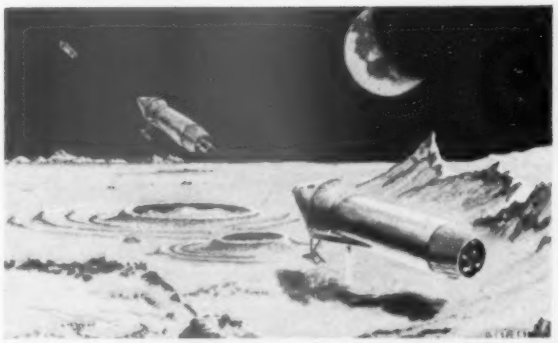
Diagram illustrating the method of returning through the Earth's atmosphere at the end of the Lunar landing mission.

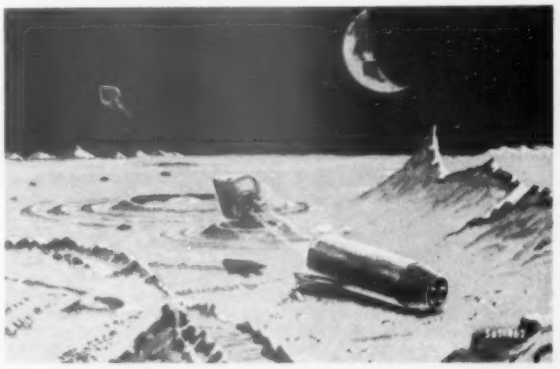
for all the launching equipment must be prepared, erected and tested, by the three men who will form the landing party. The propulsion system used for lunar take-off must be the most reliable part of the entire Apollo system. Not only must the time of take-off be planned with precision but the guidance equipment must work perfectly to place the spacecraft on the proper return trajectory. The difficulties of effecting an emergency escape from the spacecraft at the Moon end of the mission are self-evident.

Apart from this, however, it would appear desirable to land at least one unmanned duplicate of the Apollo spacecraft under remote control before any attempt is made to land a human crew.

Needless to add, in order to determine the best landing place free from major obstructions, it will be necessary to conduct a thorough survey of the intended landing area beforehand using TV-equipped robot vehicles. Further observation of the region would doubtless be possible from the Apollo B spacecraft during one of the pre-landing, circumlunar, flights.

It would then be useful to mark the chosen site with a soft-landing probe which could act as a radio homing beacon for the close-grouping of subsequent landing vehicles.

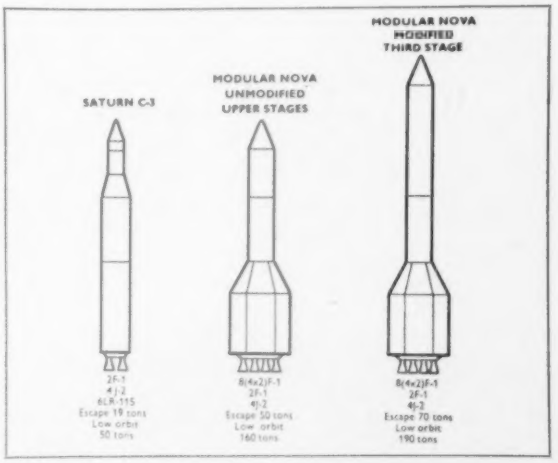




This novel VTOL system is one of the schemes being considered by NASA for landing the Apollo spacecraft on the Moon. Approach and touchdown are illustrated in the upper illustration, and take-off in the bottom one.

Returning to Earth, the spacecraft must be steered to follow a precise trajectory ensuring that it enters the Earth's atmosphere within the confines of a rather narrow re-entry corridor. The crew compartment itself, which at present is envisaged as an enlarged version of the Mercury capsule, will probably be designed to return at hyperbolic speed (about 25,000 m.p.h.) without recourse to rocket braking; obviously, this will involve more rigorous conditions of frictional heating than would be involved in returning from orbit around the Earth.

Although the Apollo return vehicle will have the form of a compact, wingless body, NASA has stated that its shape will be such that it can generate a moderate amount of aerodynamic lift. Proper control of this lift will permit the spacecraft to be manœuvred within the re-entry corridor and be guided towards a predetermined landing area. Landing will be effected "by parachutes, or similar devices."—K.W.G.



Shown to scale are three new NASA concepts for massive space boosters, the Saturn C-3 with two Rocketdyne F-1 engines totalling 3m. lb. s.t. in its first stage, and two Nova concepts for Moon-landing missions which, as far as possible, are based on propulsion systems already under development for the Saturn programme.

Discussing Aerospace Technology

FOR the past two years the British Interplanetary Society has been actively pursuing a policy which has the general aim of co-ordinating aerospace interests in Europe and the British Commonwealth. In 1959 the Society organized a Commonwealth Spaceflight Symposium and a few months later a special committee drew up recommendations urging the Government to begin discussions with other interested nations abroad, with the prospect of bringing into being a combined programme of space development to operate independently of the two major "Space Powers." In particular, it urged the retention of the Blue Streak rocket as the booster stage of a European heavy satellite launcher, recommending Woomera as the launching site for space operations.

It seems fair to say that the subsequent efforts by the Government to establish a European Space Programme based on the Blue Streak rocket, and in particular the 12-nation discussions* which took place at Strasbourg in January and February this year, directly reflect the work which the B.I.S. has done in this field. Although there is as yet no final conclusion to these deliberations, there now appears to be every chance that a joint programme will materialize, and with it a good deal of industrial co-operation between the countries concerned.

It is in this atmosphere of endeavour that the B.I.S., in collaboration with the Société Française d'Astronautique, organized earlier this week the first European Symposium on Space Technology; meetings were held at the headquarters of the Federation of British Industries in London on Jne. 26-28. The purpose of the Symposium was threefold: (1) to review certain trends in aerospace development which might be economically pursued by Western Europe; (2) to consider applications of space technology in the civilian field; e.g., communication, navigation, and meteorological satellites; and (3) to investigate the effects of space technology on the present level and structure of industry, particularly of an international nature, with consideration of political and economic aspects.

The Value of Co-operative Effort

Although many excellent papers were presented on a technical level, the "discussion papers" covering political, economic and administrative aspects of setting up a space-programme were particularly relevant to the situation at hand. For example, Air Cdre. F. R. Banks (A.T.S. Co., Ltd.) dealt with the *value* of Europe getting into space development. With America and Russia well advanced in this field, he said, it might be argued that nothing started now would matter very much when weighed against the effort and background of these two nations. Yet might it not be that while they have shown the way, we in the Western European group could now better see the pitfalls to avoid in any start we may make in the space field—though it may take at least five years to achieve anything worth while? The real incentive for any nation, large or small, to get into the space field is the return it will get in knowledge of the various technologies involved and in the training and making of high-class scientists and engineers.

So far as actual engineering collaboration was concerned, Air Cdre. Banks said that this must stem from the linking up of the various (aviation and electronics) engineering companies concerned with space engineering and supported to this end by their respective governments. But to have practical and effective international collaboration there must be the common ideal with the necessary financial interest, which can only be achieved by the various national engineering companies combining with their opposites in other countries to form international organizations to handle the planning and delegation of work on a project.

While other industries outside the primary aircraft industry can be, and have been, brought into the space and astronautics field, the aircraft industry should be the natural prime design and manufacturing source for the actual space vehicle and its engines.

As regard initiating a particular project on this basis, there must first be a feasibility study. The only way, Air Cdre. Banks believed, would be for an international (European) committee of scientists and engineers to make such a study bearing in mind the particular facilities which are available in the various countries. A committee so composed should prevent the intrusion of national influences. It would also avoid a purely scientific appraisal, since the engineering representatives will be better able to assess the important matters of practicability and time.

It was his view that any Western European consortium must now be thinking and planning a 20-year programme for space engineering "which must be really brilliant in conception—since nothing pedestrian will get anywhere or command the respect of others." He thought a European consortium without selfish interests could eventually equal America and Russia, qualitatively. But if there were no faith in such a technical linking of the European nations, it would be better to abandon the whole idea. This would then "unfortunately show the World that a United States of Europe is not possible for generations to come."

Fortunately, those whose job it may be to organize a European Space Programme have already before them an international organization—the European Organization for Nuclear Research (CERN)—which serves as an excellent model. This was brought into being about a decade ago when high energy nuclear physics in Europe was facing exactly similar problems.

In a paper describing the structure of CERN, Dr. C. J. Zilverschoon warned that in setting up a new international scientific organization, one must proceed with considerable caution. These bodies, he said, even more so than the national ones, are notorious for their tendency to indefinite growth and over-administration. Once an organization of this kind is running on the wrong track, its enormous inertia makes it practically impossible to change its course. A sizeable international organization must therefore be a success from the beginning or it may turn out to be a failure for ever.

Although some problems of a European Space Organization will differ from those of CERN, most of them will be similar. It therefore seems advisable, Dr. Zilverschoon said, to study its history and organization most carefully and use, so far as possible, this organization (which so far has proved to be a success) as an example.

CERN contracts with industry, he concluded, are notorious for being strict: a fixed price, a fixed delivery date, a penalty for late delivery and a close supervision by the responsible CERN staff member are normal clauses of the contracts.

The European industries have, nevertheless, given an exceptionally enthusiastic support to the large-scale projects of CERN. Most firms realize that, although the immediate financial profit on these contracts is only normal or even small, the additional advantages, such as the development of new apparatus or new constructional methods and the publicity value of a satisfactory delivery to CERN, make it worth while to take part in the projects of this organization.

* Jointly organized by Britain and France.

Fifth Capsule Recovery

A RE-ENTRY capsule from the satellite Discoverer XXV was successfully recovered on Jne. 18 after being in orbit two days. It was the fifth Discoverer capsule to be so retrieved.

It had been hoped to keep the capsule aloft for four days before triggering re-entry but worsening weather conditions in the recovery area and small irregularities in the satellite itself combined to cut short the test period. Nine C-119 aircraft trailing snares were patrolling the recovery area near Hawaii in an endeavour to effect mid-air recovery, with three ships standing by in case the capsule was missed and fell into the sea.

In fact, the capsule parachuted down north of the planned recovery area and though it was spotted by one of the C-119 pilots, it dropped into the ocean. A radio call from the C-119 brought a specially equipped SC54 aircraft to the scene, which dropped skindivers by parachute who quickly had the capsule aboard a liferaft.

However, although an amphibian was despatched to the scene, darkness overtook it and the machine had to return to base, leaving the recovery crew to spend the night aboard the raft.

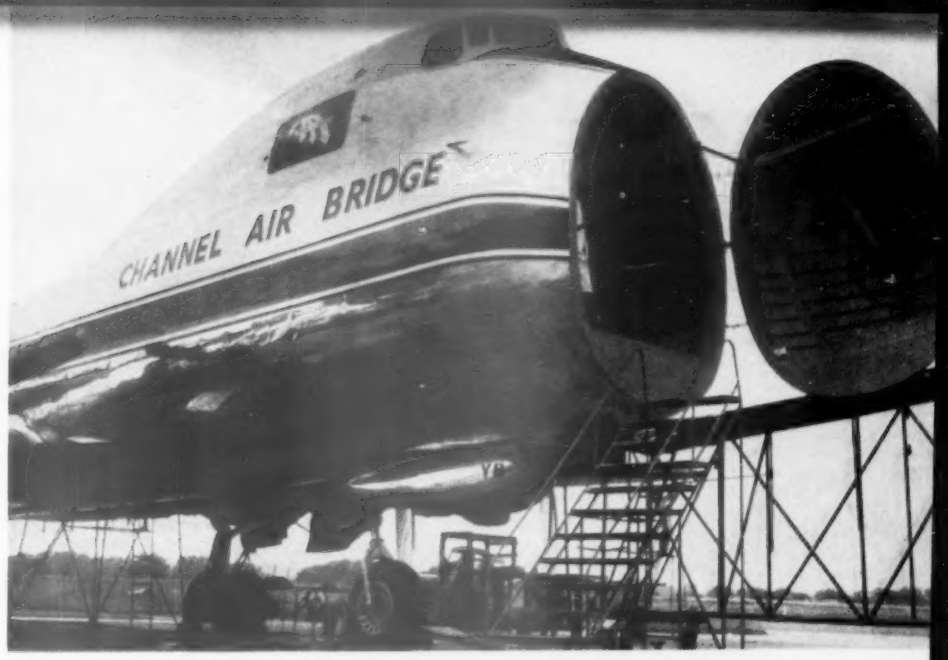
Of the four Discoverer capsules which have been recovered previously, three have been air-snatched by C-119s.

Launched from Vandenberg A.F.B. on Jne. 16 by a Thor-Agena B rocket, the satellite stage pursued a near-Polar orbit and was commanded to eject the capsule by radio. The orbit was close to that planned, with an apogee of about 250 miles, a perigree of about 140 miles, and a period of 91 min.

Inside the capsule were samples of both common and rare metals, including gold, bismuth, iron, titanium, cadmium, magnesium and nickel, to determine how they withstood exposure to a space environment. Also aboard were instruments to study cosmic radiation and the frequency with which micro-meteorites hit the satellite.

The Agena stage—which is, of course, also the satellite—embodied modifications affecting capsule ejection and is basically the same vehicle which is being developed to carry the U.S.A.F.'s Midas and Samos surveillance equipment.

A New Air Car-ferry



LAST week the Aviation Traders ATL 98 Carvair made its first flight from Southend Airport. The concept of this aircraft dates back to one day in January, 1959, when Mr. F. A. Laker, now the executive director of British United Airways, asked the chief designer of Aviation Traders, Mr. A. C. Leftley, to investigate the conversion of existing types of aircraft to give a car-ferry type which would have a hold 65 ft. long and would also carry 25 passengers. It was to have front loading doors and should be based on a type which had a good fatigue life, was available in reasonable quantity and for which spares were readily available at a reasonable cost.

Mr. Laker suggested that all possible types should be studied, but that the one eventually chosen would probably be the Douglas DC-4. And so it turned out to be. After thorough study, Mr. Leftley and his staff concluded that only with the DC-4 was it possible to meet all the requirements. All types which showed any possibility of meeting the specification were studied and every effort was made to avoid the complication involved in elevating the flight deck, but this proved inevitable.

The need for an aircraft of this type has been shown by Air Charter experience with its cross-Channel car-ferry services from Southend. In 1954 Air Charter was granted licences for services from Southend to Calais and later to Ostend and Rotterdam. These were operated initially by Bristol Freighter Mk. 31s and later by the longer-nosed Mk. 32 version of the same aircraft, which is in service today.

Although this type of aircraft is fairly suitable for operating vehicle-ferry services, experience has shown that it is not very economical and that its maintenance costs are high. It is also difficult to obtain three-car loads for these aircraft which will fit into the 42 ft. of freight hold available. If only two cars are carried, either because three cannot be fitted in or because one does not show up for its booked flight, the economics of the service suffer considerably.

Operating a cross-Channel vehicle-ferry is also difficult for a range of reasons which are not directly related to the types of aircraft used. For example, the traffic is very seasonal and even in the season there is large difference between the week-end and mid-week traffic.

Aircraft utilization on vehicle-ferry services is very low by airline standards, although in 1960 Channel Air Bridge Freighters averaged 1,455 hours. Utilization is affected by the seasonal variations in traffic and mainly because flying time is short in relation to the time spent on the ground in turn-round.

It was considerations such as these which led to the Channel Air Bridge division of Air Charter—which is now Channel Air Bridge, Ltd., a separate company of British United Airways—to survey and plan for licences to operate a range of "deep-penetration" vehicle-ferry services to France and Germany. Ideally the company would like to carry freight to fill the aircraft on the routes and also passengers additional to those travelling with their cars.

As developed by Aviation Traders, the ATL 98 Carvair will provide an aircraft well suited to operate on the deep-penetration routes and also to replace in due course the Bristol Freighters on all Channel Air Bridge routes. The company's specification for an ideal Freighter replacement is an aircraft which is cheap to buy and operate and has accommodation for 25 passengers and a 70-ft. hold to take five cars. It should be faster than the Freighter, quieter and have space for a toilet and galley. Its payload should be at least eight tons. These requirements will be met in almost every respect by the Carvair. Initial production plans for the new aircraft cover a batch of 10 for Channel Air Bridge.

The total cost of a Carvair, including the cost of the basic DC-4 and its conversion, will be under £150,000. And, despite its very much greater payload and a higher cruising speed, it is estimated that the Carvair will cost no more per hour to operate than a Bristol Freighter.

Design Details

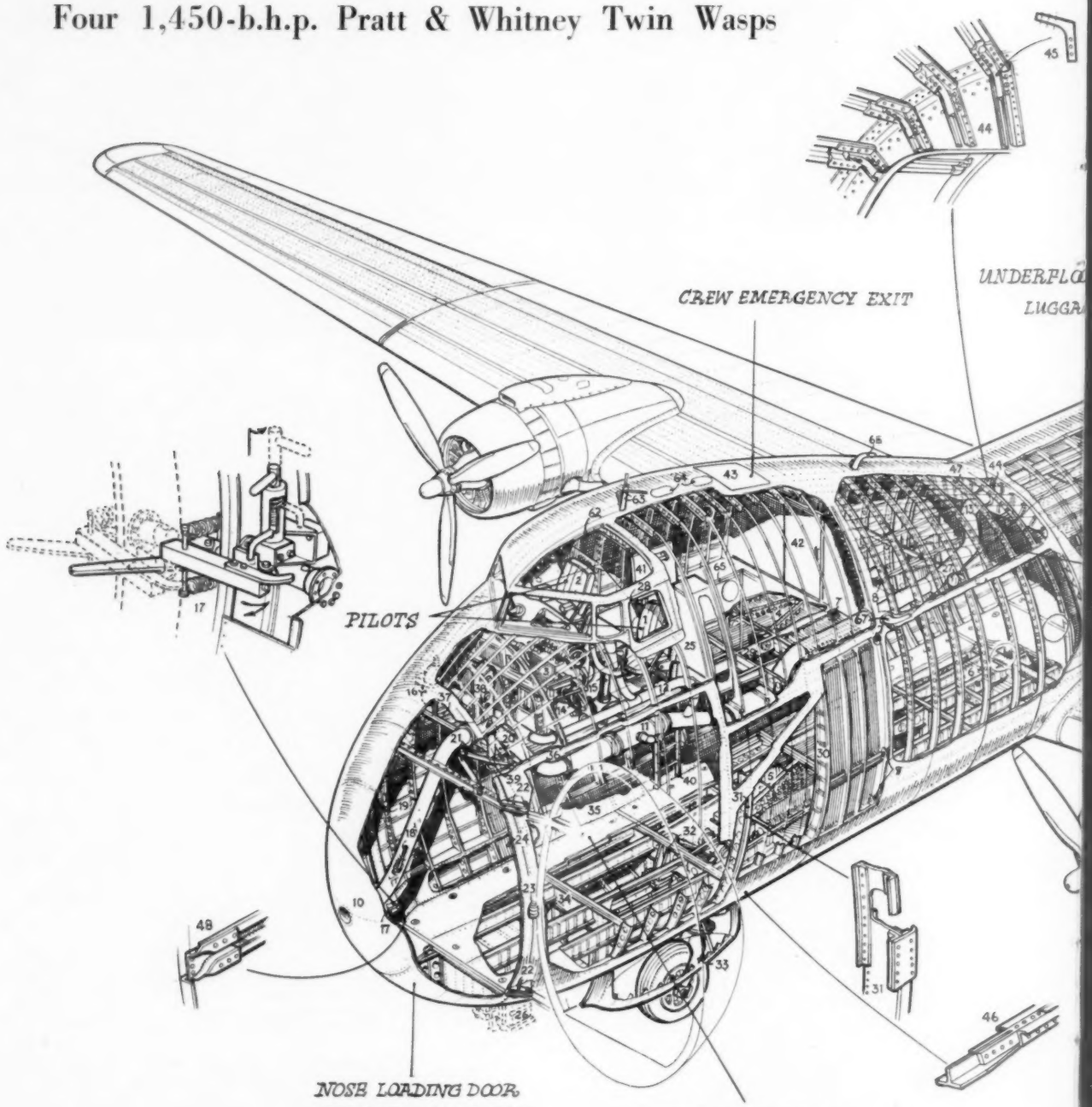
Differences between the Carvair and a standard DC-4 are confined to the nose section of the fuselage and the fin and rudder. A completely new nose section with an elevated cockpit and a nose door replaces the front fuselage of the basic DC-4. Below the flight deck the freight hold and passenger compartment extend from the nose loading door to the rear

(*Continued on page 752*)

Despite its extra depth, the new forward fuselage of the ATL 98 Carvair blends quite well with the remainder of the DC-4 airframe from which it is a conversion. A good impression of the size is given in the close-up at the top of the page.

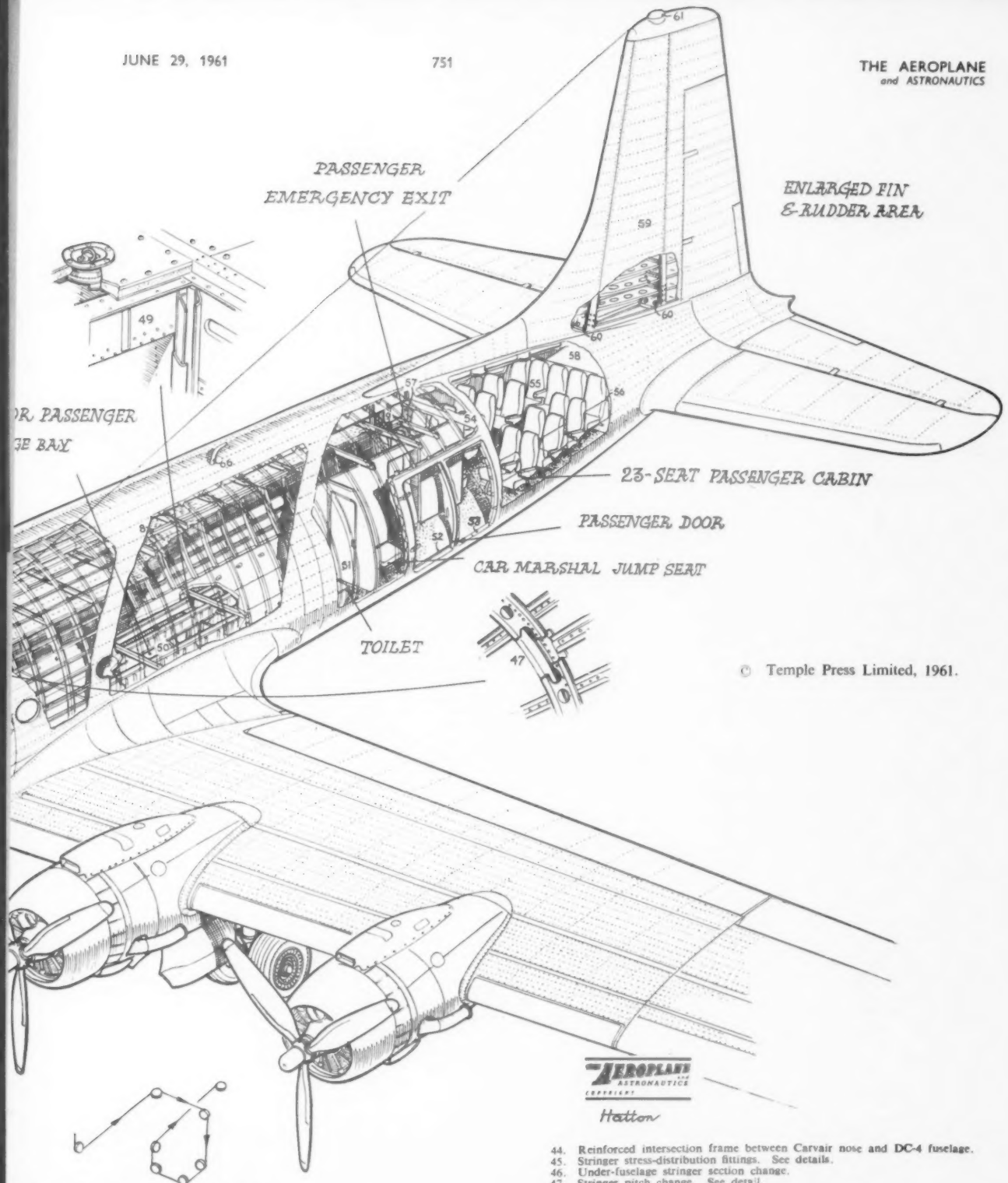
Aviation Traders Carvair

Four 1,450-b.h.p. Pratt & Whitney Twin Wasps



Key

1. 1st pilot seat (DC-4).
2. 2nd pilot seat (DC-4).
3. Engine control pedestal (DC-4).
4. Accessory control pulley bank in crew compartment floor.
5. Accessory control pulley bank in freight compartment floor.
6. Existing DC-4 pulley banks.
7. Aileron pulleys.
8. Elevator and rudder cables.
9. Elevator and rudder pulley bank in rear fuselage.
10. Cabin heater air intake.
11. Cabin heater.
12. Windscreen demisting hot-air duct.
13. Rear cabin hot-air duct.
14. Rudder pedals (DC-4).
15. Control column (DC-4).
16. Fire bottles (CO_2) above each side of nose door.
17. Nose-door lock (two). See detail.
18. Twin hydraulic hand pump for nose-door operation.
19. Hydraulic selector valve (nose door).
20. Nose-door hydraulic jack.
21. Actuating levers.
22. Locating hinges offset vertically 5°.
23. Support hinge.
24. Hydraulic pipe bay.
25. Electrical junction box.
26. Retractable batteries.
27. Ice detection lamp.
28. Windscreen structure.
29. Crew floor beams containing control runs.
30. Rear main load-carrying frame for nosewheel, controls and floors.



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PICAL CONTROL RUN DIAGRAM

Hatton

31. Front main load-carrying frame for nosewheel, controls and floors.
32. Nosewheel up-latch and bumper structure.
33. Nose undercarriage (DC-4) lowered 4 in. from original datum.
34. Transverse freight floor beams; approximately 5-ft. pitch.
35. Freight floor side-box beam, also acting as kicking plate.
36. Crew compartment forward bulkhead.
37. Horizontal shear panel taking controls and seat load.
38. Nose-door vertical jack post.
39. Nose-door lever pivot post.
40. Crew compartment access ladder.
41. Crew compartment entry hatch.
42. Sliding emergency hatch.
43. Crew emergency hatch.
44. Reinforced intersection frame between Carvair nose and DC-4 fuselage.
45. Stringer stress-distribution fittings. See details.
46. Under-fuselage stringer section change.
47. Stringer pitch change. See detail.
48. Stringer end fitting. See detail.
49. Typical freight-lashing and floor-beam junction. See detail.
50. Under-fuselage baggage compartment.
51. Toilet.
52. Passenger door.
53. Freight door retained and bolted into position.
54. Passenger compartment forward bulkhead.
55. Twenty-three-seat passenger compartment.
56. Large passenger windows.
57. Passenger emergency exit with window.
58. Passenger compartment rear bulkhead.
59. Enlarged area fin and rudder.
60. New fin root fittings.
61. Rotating anti-collision light.
62. Main switch panel in roof.
63. VOR/ILS radio mast.
64. DF radio loops.
65. Radio racks.
66. VHF radio masts.
67. HF radio mast.

(*Continued from page 749*)

bulkhead. This gives an uninterrupted floor length of 81 ft. 2 in. and a freight volume of more than 4,500 cu. ft.

When the aircraft is used for vehicle-ferry flights, a compartment for 23 passengers is installed at the rear of the fuselage and there is a 68-ft. length of hold ahead of this compartment, sufficient to take five cars.

These considerable extensions to the freight-hold length of the basic DC-4 have been made possible by the increased length of the new nose section and by moving the rear bulkhead 47 in. farther back than in the standard DC-4. Additional large windows and escape hatches have been installed.

Although primarily intended for car-ferry operations, the Carvair can be operated as a pure freighter or in a combined passenger/freight rôle. In this case the movable bulkhead which separates the passenger and freight compartments is moved to give a 32-seat passenger compartment and a 60-ft. hold which is large enough to take four medium cars or combinations of vehicles and cargo. The bulkhead is removed completely for freight operations.

The completely new nose section of the Carvair lifts the flight deck 6 ft. 10 in. above its standard DC-4 position and gives a headroom in the hold of 6 ft. 8 in. Its large nose door is hinged on the port side and opens through 180°. Freight and vehicles can be loaded from a ramp, a lifting platform or fork-lift truck, or from a dock.

The spacious flight deck provides a good view for the pilots. It is entered by a ladder on the starboard side of the freight hold; this leads to a hatch in the flight-deck floor just behind the second pilot's position. The flight deck has been laid out for operation by two pilots, but space is available for additional crew members if these are needed for long-distance flights.

In designing the new nose section every effort has been made to follow DC-4 design practice and to use as many of the original DC-4 parts as possible. The structure is built of copper-based aluminium alloys. The nose wheel is carried in DC-4 forgings and the windscreen structure is virtually identical with that of the original aircraft. The cockpit layout is a cleaned-up version of that used on the DC-4 and nearly all the expensive fittings are those of the original aircraft.

Model tests of the Carvair were made in a wind-tunnel at the College of Aeronautics. The increased fin area necessary was checked by a direct model comparison of lateral characteristics. The shape of the fairing behind the flight deck was carefully tested and modified until tuft tests showed that there was no flow breakaway until an incidence of 4° above that at which the wing stalled, was reached.

The basic generating system and components of the original aircraft have been retained. The chief improvement consists of the introduction of main and essential busbars with isolating control, completely segregated and protected in the crew compartment junction box. Failure warning lights for generators and busbar isolation are provided. The output of each generator is fed to the segregated busbars via individual protection feeders, and all essential services are separately protected. The system complies with CAR 4b.

Flight, engine and auxiliary controls are all cable-operated. Neither the powerplant nor the main hydraulic system of the DC-4 are affected by the conversion, but there is an additional self-contained hydraulic system with a handpump which has been installed to open and close the nose door.

The Air Registration Board is to certificate the Carvair for operation on the British register in the existing unclassified performance group. This is the same group as for any British-registered DC-4. For overseas operators Aviation Traders will certificate the aircraft to CAR 4b with a negligible performance penalty. The handling of the Carvair will be assessed against 1956 B.C.A.R.s and if the basic aircraft falls short in any way, then clearance will be made by comparison with the excellent handling characteristics of the DC-4.

The aircraft will meet the take-off and landing field requirements for all the routes operated by Channel Air Bridge, including those for Calais, which has the smallest airfield. Because cars represent a low-density load for an aircraft, there will be no payload restriction on the number of vehicles and passengers that can be carried.

Installation of the extended nose and larger fin of the Carvair represent a structure-weight penalty of only 2,300 lb. The increased drag of the large nose is not expected to decrease the performance of the aircraft to any extent; the cruising speed, however, is likely to be 10 m.p.h. less than that of the DC-4.

Future Plans

As already mentioned, Aviation Traders are initially converting 10 DC-4s into Carvairs for Channel Air Bridge. A great deal of interest in the project has been shown by other DC-4 owners and the company will be converting a further batch of these aircraft as a private venture for sale to other operators.

Following successful operation of the Corvair, there may well be a considerable demand for this conversion. Aviation Traders plan to offer a conversion service. There are approximately 300 DC-4s still in service, many of them in the United States, and the company is considering sending a Carvair on an overseas sales tour to interest these operators in the conversion.

Despite the long life of current DC-4s—few in service have flown fewer than 30,000 hours—the Carvair conversion offers an economical and cheap freighter with a considerable airframe life. The first aircraft converted is a DC-4 which has already flown 37,000 hours, but its ultimate airframe life is put at about 60,000 hours. This represents many years of service, particularly on vehicle-ferry routes, where an annual utilization of 1,500 hours is exceptionally good.

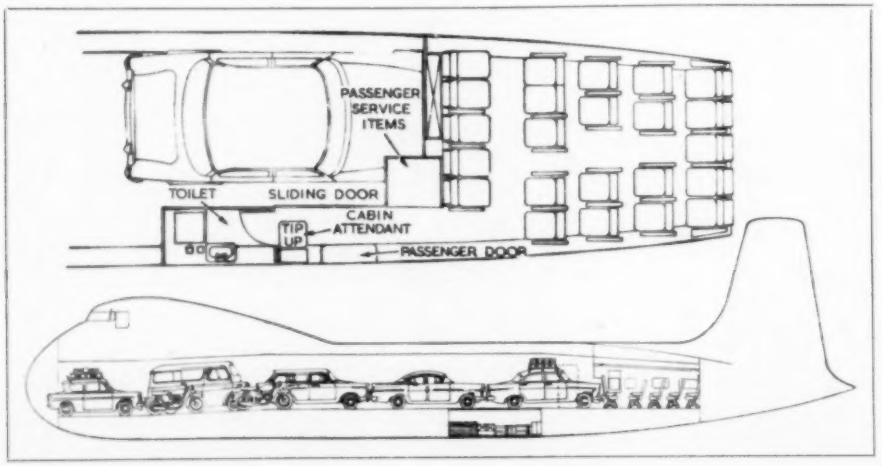
If the Carvair conversion proves popular, Aviation Traders feel that there will be a demand for similar conversion of DC-6 and DC-7 aircraft. These have great potentialities, for a Carvair-type conversion into a nose-door freighter. But this is a long-term plan; the company considers that converting DC-4s may well keep them busy for several years.

DESIGN DATA

Dimensions.—Span, 117 ft. 6 in.; overall length, 102 ft. 7 in.; height, 29 ft. 10 in.; max. freight-hold length, 81 ft. 2 in.

Weights.—Empty (pure freighter), 40,372 lb.; max. zero-fuel, 59,000 lb.; max. take-off, 73,800 lb.; max. landing, 64,000 lb.; max. payload, 17,635 lb.

Performance.—Cruise speed, 169 kt. at 5,000 ft. and 71,250 lb. all-up weight with fuel consumption 1,250 lb./hr.; range, 1,700 miles with 17,635-lb. payload, IFR conditions and full S.B.A.C. allowances; car-ferry direct operating costs per "motorized unit" (one car plus 4 passengers), 100% load factor, S.B.A.C. method, £32 for a 14-ft. car over a 460-mile stage; take-off balanced field length at sea level and 73,800 lb. all-up weight, 5,300 ft. in I.S.A. conditions or 5,950 ft. at I.S.A.+15° C.; landing distance from 50 ft. at 64,000 lb. all-up weight, 2,800 ft. at sea level in I.S.A. conditions, 2,975 ft. at I.S.A.+15° C.



The basic layout in the Carvair is for the accommodation of five vehicles and 23 passengers. Other hold arrangements can be made by moving the bulkhead separating the passenger cabin from the freight compartment.

Airport Equipment and Cargo Handling

METROPOLITAN AIRPORTS

A study of the airport systems serving London and Paris, by F. G. Swanborough

TWO hundred miles apart and serving the 12-million population of Europe's two largest cities, the airports of London and Paris provide an interesting comparison in metropolitan airport design. Both cities have similar problems—to provide terminals within easy reach of the centre which are capable of handling, simultaneously, all types of traffic from the trans-atlantic and intercontinental long-haul to the regional and high-density short-haul. The airports of London and Paris are the two busiest in Europe and the London-Paris route itself is one of Europe's most-used.

Both London and Paris now have a No. 1 airport (Heathrow and Orly respectively) handling the bulk of the traffic; with secondary airports (Gatwick and Le Bourget) for additional services. Between them, these airports handled 308,350 aircraft movements and 9.5 million passengers in 1960. All four airports are well equipped with runways and landing aids to meet the present needs of the largest jet aircraft, and further runway construction is planned, as noted later. It is not the purpose of this article, however, to describe "airside" facilities in detail, but rather to examine the way in which the London and Paris airports—particularly Heathrow and Orly—are organized to facilitate the flow of passengers to and from their aircraft, and the way in which they are administered and financed. Writing in the 1960 edition of this Airports Number, we stressed the need to design an airport terminal building as no more than a bridge linking two methods of transport (air and surface).

Neither Heathrow nor Orly are perfect in this respect, but a real attempt seems to have been made to cut down elapsed "terminal" time to the minimum in the new building at Orly, and great improvements have recently been made in the No. 1 passenger building at London (Heathrow) Central. By making it possible for incoming passengers at London to move individually through immigration control and (if they have no registered baggage) through Customs, times as short as 4½ minutes from aircraft to car have been achieved; 8-10 minutes is now a fair average.

The new long-haul building at London (Heathrow), to be in partial use by B.O.A.C. later this year, has a traffic flow pattern

Top, an aerial view of the new terminal building at Orly.

Left, London (Heathrow) Central, showing the main passenger terminal beyond the control tower, and the Queen's Building to the left. The new long-haul terminal is off the picture to the right.

similar to that adopted at Orly, although the airside waiting lounge will be less sumptuous and have fewer amenities than the magnificent transit lounge in the French terminal. The one area in which there is still room for further improvement at London is that of inward Customs inspection. For the greatest convenience of the most travellers a system is needed whereby one group of Customs officers conducts the preliminary investigation and either clears the baggage or, if duty is payable on any item or detailed examination is called for, sends the passenger on to a second group of officers so positioned as to prevent any interruption in the flow of passengers.

The extent to which passengers should be shepherded through a terminal still occasions much debate. Airlines tend to favour grouping into aircraft loads as soon as possible, as lost passengers often mean delayed aircraft. A more ruthless adherence to departure times might go some way to making passengers more careful.

On the other hand, as air travel becomes more widely accepted in Europe—to the extent that it now is in the U.S.A.—more and more passengers should wish to be regarded as adults and allowed to find their way to their aircraft, or at least the departure gate, on their own and at will. This philosophy is adopted at Orly and in London's long-haul building—but more attention must be given than at present to informing the passenger (visually as well as orally), at the earliest possible moment, of his departure gate and time.

London and Paris now differ in one fundamental: with the decision to abandon down-town check-in facilities in Paris. Airline buses still run from the Invalides terminal, but all passengers check in at the airport, and are themselves responsible for getting to Orly or Le Bourget at the right time. In London, it is still possible to check in at Victoria, Cromwell Road and other town terminals, where to catch the coach is to catch the aircraft. Rather more than half of all passengers departing from London Airport now make their own way to the airport, however, and the number of check-in desks in the No. 1 passenger building has had to be doubled for this reason.

Neither London nor Paris succeed in profitable airport operation. Direct comparison of financial results is difficult because of different accounting methods, but in the case of London, at least, an attempt is made to apportion all costs in the airport accounts, and so to obtain a realistic figure. On operating figures alone, London (Heathrow) and the two Paris airports together are profitable but Government subsidy is necessary to cover interest charges on capital. In France, such a subsidy is accepted on principle; in the U.K. it is not.

Metropolitan Airports—London

INFRASTRUCTURE

London (Heathrow) Airport is 14 miles west of Charing Cross, close by the site, on Hounslow Heath, of the old aerodrome from which the first London to Paris air service was flown on Aug. 25, 1919. The present site was first developed as an aerodrome by the Fairey Aviation Co. in 1930, when it was known as the Great West Aerodrome. It was acquired by the Air Ministry in 1943 to be developed as a major airfield for R.A.F. Transport Command and was then earmarked for possible civil development in the future.

Runway development began, but the Ministry of Civil Aviation took over before the R.A.F., in fact, used the airfield, and the first scheduled commercial flight was operated from the renamed London Airport on Jan. 1, 1946. By the end of 1946 the first three runways had been completed, and three more were added subsequently, isolating the 52-acre central area which had been set aside for development as the main terminal. One runway has now been closed, and the two longest of the others are the E.-W. parallels, respectively 11,000 ft. and 9,313 ft. long. The N.E.-S.W. parallels are 7,734 ft. and 6,255 ft. and the single N.W.-S.E. runway is 7,560 ft. The airport covers 3,000 acres.

A temporary terminal was established on the north side of the airport adjacent to the Bath Road and is still used for the majority of long-haul operations. The central area contains the main short-haul terminal, which came into use in mid-April, 1955, together with an airline operations block (the Queen's Building). The eastern side of the airfield has been developed as a 240-acre maintenance area and includes the central B.E.A. and B.O.A.C. engineering bases; a second maintenance area, on the S.S.E. side, is also in use and a third site has been reserved for development.

Gatwick, the London No. 2, was first developed (privately) as an airport in 1936. It is 27 miles to the south, beyond the ridge of the North Downs, and was acquired by the Government for development in 1952. It handles an increasing amount of scheduled traffic, both short-haul international and domestic, in addition to most of the inclusive-tour flights serving London, and London (Heathrow) diversions. The new terminal and a single 7,000-ft. runway were opened in June, 1958. A maintenance area is being developed, principally for the use of independent operators using the airport.

The only London heliport is privately owned and operated on the river Thames at Battersea.

A third airport in the London area (by official definition) is Stansted, owned by the Ministry since 1949 and used exclusively for civil operations since 1958. It has two runways (10,000 ft. and 4,200 ft.) but no modern passenger-handling facilities, and is used chiefly for charter and trooping flights.

CAPACITY

In 1960 London Airport handled an average of 14,740 passengers a day, and 400 aircraft movements. The totals for the year were 5,380,937 passengers, 146,506 movements, 88,049 tons of freight and 15,026 tons of mail.

Gatwick accounted for 475,020 passengers, 35,848 movements (19,593 air transport), 9,402 tons of freight and 274 tons of mail. The London heliport handled 621 passengers and 1,865 movements, of which 303 were classified as air transport; there were no scheduled transport movements.

Including Blackbushe (which closed during 1960) and Stansted, the totals for the London area airports in 1960 were 5,934,423 passengers, 215,558 aircraft movements (156,659 air transport), 97,652 tons of freight and 15,303 tons of mail.

Some 50% of all passengers departing from London (Heathrow) now check-in at the airport. The number of check-in desks, on the ground floor of the No. 1 passenger building, has been increased from 9 to 17 and each desk handles passengers for any destination. Registered baggage is sorted and goes through to the rear (airside) of the building.

Photographs copyright "The Aeroplane and Astronautics"

Having checked in, passengers ascend to the first floor concourse for departure from Channels 1 and 2 (domestic) or Channels 3 to 6 (international), in the left background here. All international channels converge through immigration, in what used to be the outward Customs Hall.

Ultimately, London (Heathrow) is expected to be able to handle some 13 million passengers annually. By 1970, it is forecast, some 17 million passengers a year will be using London airports; Gatwick should be able to handle the difference of four million. Overall development plans have to take into account the maximum rate at which aircraft can be controlled in the London Control Zone (regardless of airport); the maximum movement rate at individual airports in IMC (about 64 an hour at Heathrow and fewer at Gatwick); the number of aircraft stands available and the size and load factor of aircraft types in use; and the passenger terminal facilities.

The existing passenger terminal in the London (Heathrow) central area has a total capacity for some five million passengers a year. In November, the first part of the new long-haul building (see below) will come into use, and will eventually handle three million passengers a year. In the preliminary planning stage is a third building, for short-haul and domestic passengers, with an ultimate capacity of five million a year. Also under construction in the central area are three 100,000-sq.-ft. freight-handling blocks (with a possibility of three more to be built on the North side).

Developments at Gatwick are the construction of the second half of the terminal block, needed in two to three years to match runway capacity, followed possibly by construction of a second runway. Plans are also being made for construction of a London Heliport. Beyond 1970 the need for a third airport is foreseen. Logically, this would be to the north of London and official thinking seems to favour Stansted although no final decision has been made.

Beyond immigration control, passengers wait in the airside lounge, now being enlarged to include the space previously occupied by immigration procedures.

PASSENGER HANDLING AND COMMUNICATION

The new long-haul building in London Central has been designed to allow much greater freedom of passenger progress than was originally planned in the short-haul building. The sequence will be as follows for passengers arriving by private transport:—

1. Enter building through main frontage at ground level, using the " departures " half of the terminal.

2. Check in on ground floor. Registered baggage goes straight through to airside of building, to be sorted into bins according to flight and destination. Customs inspection is not normally required but facilities for spot-checks will be provided adjacent to check-in desks. Passengers ascend to first-floor concourse.

3. Pass at will through immigration check point to the airside lounge, which has bar and buffet facilities. Full restaurant facilities are available on the townside, at first-floor level in the south block of the building. Passengers arriving by coach, having checked in at the town terminal, will enter the building through this wing and reach the main concourse at first-floor level, so that coaches do not occupy space on the main frontage of the building.

4. When flight departure is called, passengers move from airside lounge to one of two stub " fingers " for direct embarkation, or coach to distant aircraft stands as necessary. Eventually, two " fingers " will

From the airside lounge, passengers proceed along the airside gallery (right) to the appropriate departure gate.

be built from each stub, and one more each from the north and south office blocks, with provision for straight-in access to aircraft at first-floor level. Maximum planned walking distance is 1,000 ft.

Inbound passengers reach the " arrivals " half of the terminal through the same fingers, passing through immigration on the first floor and going down to the Customs hall. Baggage is driven to the outer wall of this hall, into which it passes on a moving belt, to be claimed by its owner and taken to any available Customs officer.

In recent months the existing short-haul building has been modified to permit, so far as is possible, a similar system. One side of the building is used for departures, the other for arrivals, and the processing of passengers in single-aircraft groups has been largely abandoned.

At Gatwick, passengers and baggage check in on the first-floor level, and passengers remain at this level to pass through immigration and Customs (when their flight is called) and go along the single 900-ft. finger, descending to ground level at the appropriate gate.

Access to London (Heathrow), which is adjacent to the Great West Road out of London, has been greatly improved by recent road developments, and more are planned. Coach times are about 30 minutes from Victoria and 25 minutes from the West London Air Terminal, both of which have check-in facilities. The nearest rail link is the Underground terminus at Hounslow, two miles away; there are good public transport connections from here and from the centre of London. Car parks accommodate 900 on the North side and 2,600 in the centre; a 2,000-car multi-storey park is planned to be ready by early 1963 in the central area.

Gatwick is served by train (40 minutes from Victoria) and is astride the main London-Brighton road. Other than the rail link, public transport connections are poor. Access to Stansted is difficult.

ADMINISTRATION AND FINANCE

London's two major airports and Stansted, and 23 other airports in the U.K., are owned and administered by the Ministry of Aviation under powers conferred by the Civil Aviation Act, 1946. Control is exercised by the Ministry's Aerodromes Group through the offices of the under secretary (management) and under secretary (planning). Air traffic control and associated activities are the concern of the Aviation Navigational Services Group, headed by a director-general. Direct responsibility for the day-to-day running of each airport is vested in the commandants.

The Ministry is responsible for the provision and maintenance of all runways, aprons, airport lighting and terminal buildings at its airports, but most of the hangars and workshops are built by the users on ground leased from the Ministry. Apron services, including the transport of passengers and baggage to and from the aircraft, are at present provided by the Ministry for those airlines which require them.

Individual accounts are kept for individual airports under Ministry control, as well as consolidated accounts for the total operation. It is declared Ministry policy that the airports should be made to pay their way and, although they have not yet done so, increased landing fees and other measures are expected to reduce the loss measurably in the next year or two.

In the year ended Mar. 31, 1960 (the last for which figures are available), London's two airports together had an operating income of £5,089,322 and an operating expenditure of £5,336,303 —a deficiency of £246,981. To this had to be added £330,783 for H.Q. and divisional administration and £1,724,461 for interest on capital (5.31% on fixed assets and 4.17% on working capital) for a total deficiency of £2,302,225. It is worth recording that London (Heathrow) showed a profit on operations of £402,809, which was sufficient to cover H.Q. and divisional administration costs, but fell short of the sum required to cover interest charges by well over £1 million. Up to March, 1960, the Ministry had spent £30 million on land, buildings and civil engineering works at London (Heathrow).

Income at U.K. airports is derived from aircraft landing, parking and apron-service fees, passenger-service charges, rents, services to tenants, concessions, and car park and public admission charges. In the case of Heathrow, landing, parking and apron-service fees accounted in 1959/60 for just over 56% of the total operating income; at Gatwick they represented a little under 50%.

Metropolitan Airports—Paris

INFRASTRUCTURE

Orly is 11¼ miles from the centre of Paris and 5¼ miles from the city boundary at Port d'Italie, on the Villejuif Plateau to the south. First used as an airfield towards the end of World War I, it became a base for the French Aéronavale airships, and its concrete hangars were for long a prominent landmark. Severely damaged during World War II, Orly was designated for development as a civil airport in 1946 and operations began with the most rudimentary of installations.

Full-scale development of the airport began in 1950 and led to construction of two separate terminals (North and South), with first two, and then three, runways. The longest of these, opened in November, 1959, is 3,300 m. (10,826 ft.), approximately E.-W. in direction. Two others are parallel, running N.E.-S.W. and respectively 2,400 m. (7,875 ft.) and 1,865 m. (6,120 ft.) in length. A second E.-W. runway, parallel with the first, is planned, to provide one take-off and one landing runway in the prevailing wind direction; the runways will be staggered, with one end of each adjacent to the terminal. Orly Airport at present occupies 2,500 acres, with another 1,000 acres reserved for development of the second runway.

The new terminal itself has been built alongside the former South terminal, and was formally opened by President de Gaulle on Feb. 24 this year. It covers 1.4 million sq. ft. of floor space on nine levels, and is described in more detail under the " passenger handling " heading later.

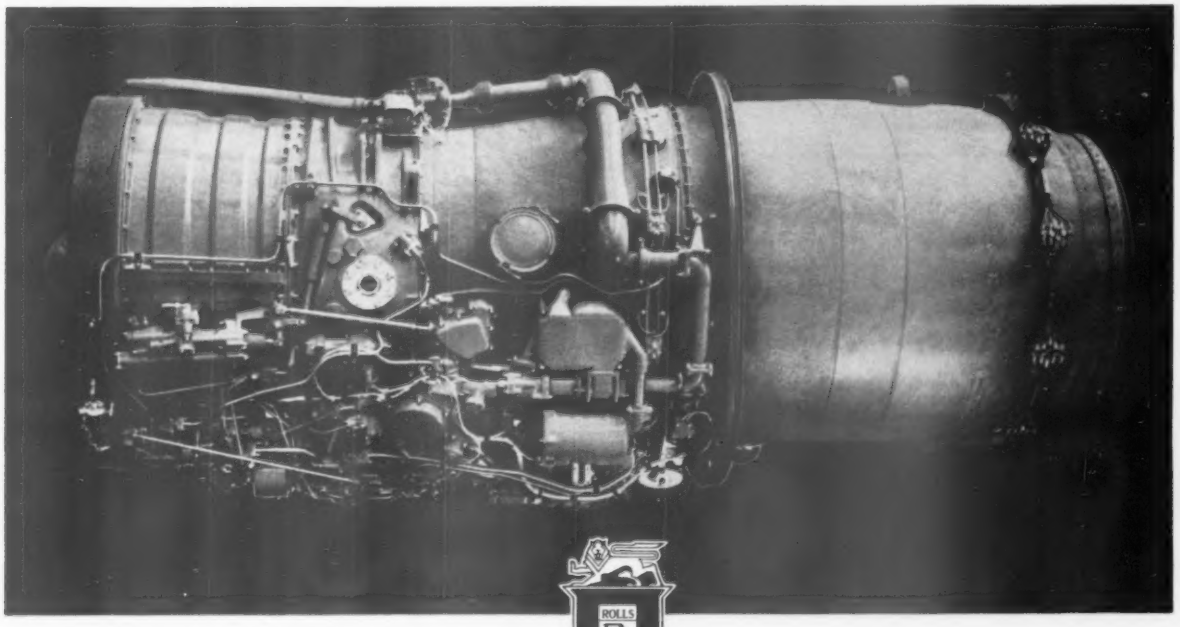
On the north side of the airport is a 5,000-ft. long maintenance area, including four large new hangars, of which the largest provides an uninterrupted space 985 ft. by 180 ft. by 47.5 ft.

Le Bourget, now the Paris No. 2 airport, has a longer commercial history than Orly, and before World War II was the city's principal air terminal, comparable to London's

(*Continued on page 757*)

All passengers arriving at Orly must check in at the airline desks (behind the row of pillars in this picture) on the ground floor. Baggage goes direct to the airside.

ROLLS-ROYCE SPEY



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Esso

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WHAT'S POETIC ABOUT PRESTWICK?

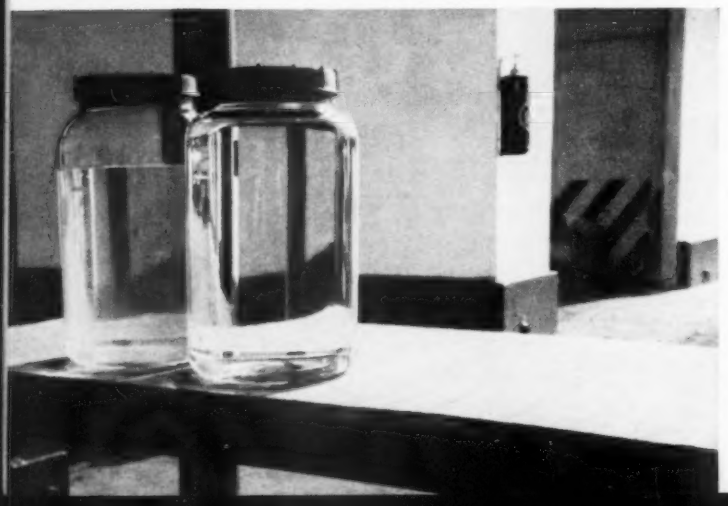
What has Prestwick in common with Scotland's national poet?
The airport is located in the midst of the Ayrshire countryside, immortalised by Robert Burns. The present terminal building, formerly the Orangefield Hotel, was once a private mansion where, more than 150 years ago, the poet was entertained. And although Prestwick is now Britain's No. 2 trans-Atlantic airport it remains as characteristically Scottish as the works of Burns himself.

How long has it been a trans-Atlantic airport?
Since 1941, when construction of the existing main runway began. Prior to that time it had been a grass aerodrome since 1935 when it was built as the airfield for Scottish Aviation Limited. But early in World War II the aerodrome's reputation for good weather became widely recognised and Prestwick was adopted as the U.K. terminus of the trans-Atlantic ferry route. Traffic increased steadily so that by the end of the war some 37,000 aircraft had passed through on the ferry route alone.

Is there any Service traffic today?
Yes. Not only is Prestwick a busy international airport but it also handles a considerable volume of military transport traffic. The Military Air Transport Service of the USAF has a large base on the airport and an Air/Sea Rescue Unit, including helicopters, is also located there. So at Prestwick Esso helps to meet both civil and military requirements by means of a flexible organisation adapted to the needs of each with swift safe service as the common factor.

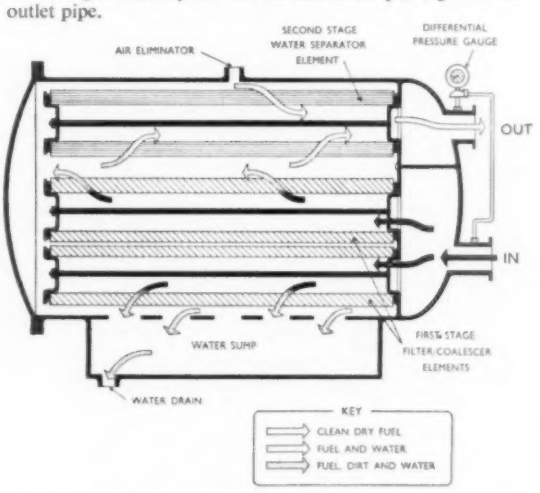
How does Esso ensure safe service?
By thorough training backed by extensive first-hand experience. By unsurpassed research facilities. And by a strict system of quality control applied right down the line from refinery to airport bulk storage, from bulk storage to refuelling equipment and from refuellers into the aircraft tanks. A system which includes the stage-by-stage check of samples such as those shown below.

What do these samples show?
These are two test specimens of aviation turbofuel, one taken upstream and the other—the "clear and bright" example on the right—downstream of a filter/separator: one of the most important components of a turbofuel handling system.



In such a system fuel normally passes through filter/separators at least three times.

And how does a filter/separator work?
It usually employs two stages as shown in the diagram. The elements of the first stage have the dual function of filtering solid contaminants and coalescing finely dispersed water. The second stage serves to repel or divert free water to the water sump thus preventing any coalesced water droplets which are still being carried by the flow of fuel from passing into the outlet pipe.



This is just one way in which Esso ensures safe service—always vital but never more so than at a trans-Atlantic airport handling both civil and military long-haul traffic.

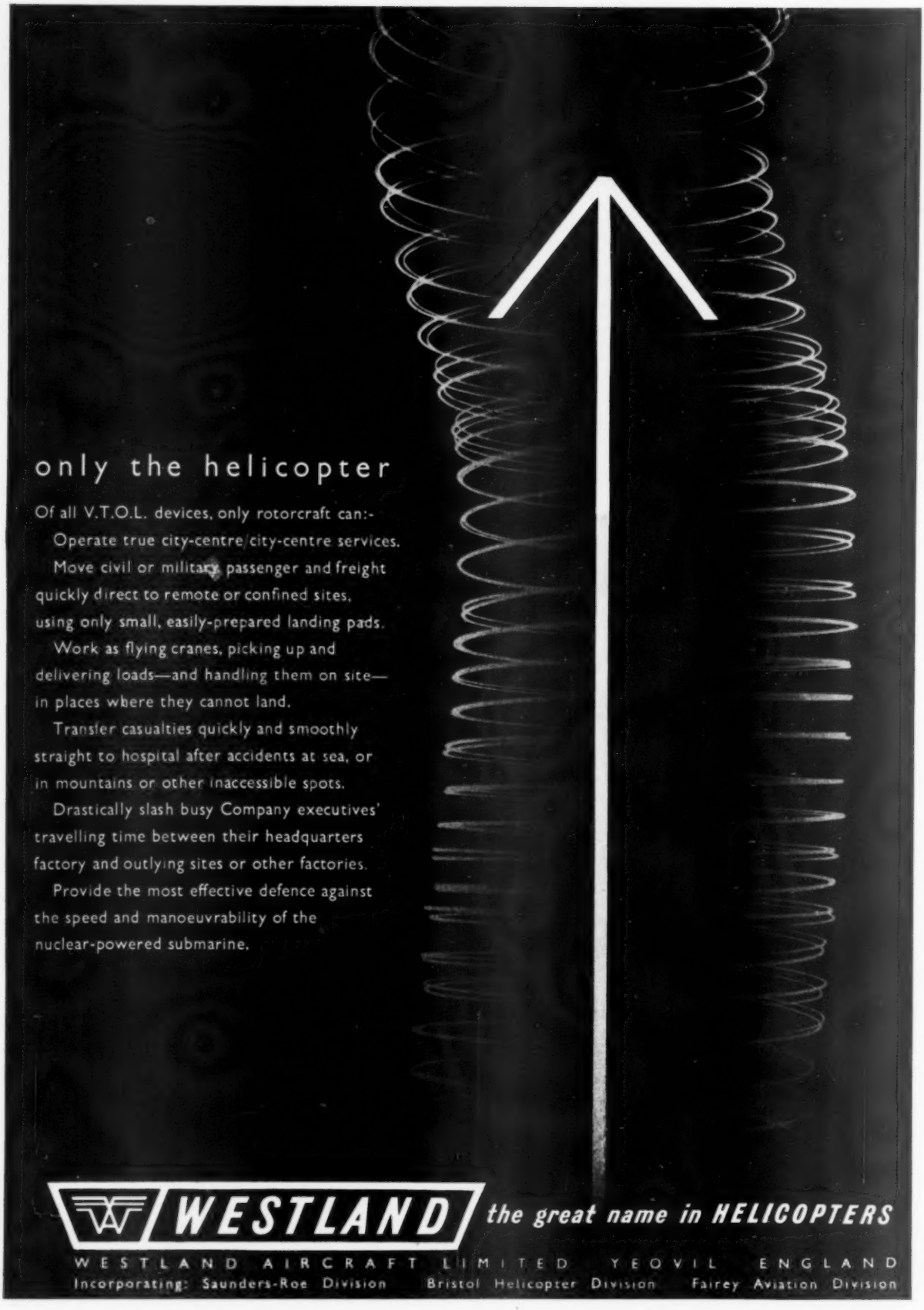
What is the traffic picture today?
Prestwick is busy and getting busier. Back in 1947 some 81,000 passengers used the airport. By 1959 the figure stood at 243,658 and last year it increased to 301,257. Apart from military transport operations five of the World's principal airlines route trans-Atlantic services through Prestwick, to say nothing of seasonal short-haul operations and the fact that the airport also handles flight tests of military aircraft overhauled by Scottish Aviation Limited.

And what are Prestwick's future plans?
The recent extension of the main runway to 9,800 feet is only the first stage of the Ministry of Aviation, Scottish Division's, airport redevelopment scheme to make Prestwick fully capable of handling future jet traffic. A new control tower and fire station are being built and a new terminal building and apron is planned with a hydrant refuelling system which will incorporate much in the way of Esso's latest design-thinking. Prestwick is planning for the future in a big way and Esso is proud to be of service—swift efficient service for today and tomorrow with safety as a primary concern.

Esso Petroleum Company Limited,
Aviation Department,
36 Queen Anne's Gate, London S.W.1
Telephone: HYDe Park 7030

Military movements can hardly be scheduled. Plotted on a graph, the fuel demands at Prestwick would therefore show a series of irregular peaks which can be met only by calculated hustle.

A DC-8 of Scandinavian Airlines System arrives at Prestwick. Esso personnel are proud of the mutual understanding and respect that grows between them and the airliner crews of all nationalities.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Of all V.T.O.L. devices, only rotorcraft can:-
Operate true city-centre/city-centre services.
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Transfer casualties quickly and smoothly straight to hospital after accidents at sea, or in mountains or other inaccessible spots.
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The first-floor concourse at Orly has a large departure indicator (extreme left), shops and a view across the main runway.

(*Continued from page 756*)

Croydon. Covering 1,500 acres, Le Bourget is 10½ miles to the north of the city and has been administered by the Paris Airport Authority since 1949. In addition to its own scheduled traffic the airport handles diversions from Orly in bad weather. On more than 50% of the occasions when fog closes Orly, Le Bourget remains open. A new 9,850-ft. E.-W. runway was completed in 1960 to supplement the 8,860-ft. N.-S. runway, and a large new hangar has also been built, similar in design to those at Orly.

The Paris airport system also includes the heliport at Issy (a former airfield), which will be suitable for the operation of STOL aircraft if they conform to the Authority's noise requirements.

CAPACITY

In 1960 Orly handled an average of 7,300 passengers a day, with 205 aircraft movements; peak totals were 11,385 and 263 respectively. The year's totals were 75,000 movements, 2,675,000 passengers, 40,000 tons of freight and 12,500 tons of mail.

Le Bourget accounted for 40% of the total Paris traffic in 1960, with 51,000 aircraft movements, 961,000 passengers, 20,000 tons of freight and 10,000 tons of mail. Peak-day figures were 212 aircraft movements and 5,249 passengers.

The heliport at Issy recorded 6,800 helicopter movements, of which 1,250 were commercial flights serving 8,336 passengers.

With the addition of the second E.-W. runway, more apron areas and a second finger on the terminal building, Orly is expected to be able to handle 7-8 million passengers a year, while Le Bourget, with no major developments, should be able to handle four million. This total of about 12 million passengers is expected to be reached in Paris by 1975.

The long-term plan, to provide additional capacity after 1975, includes development of a large new Paris Nord airport, farther from the city than Le Bourget. This airport, for which a site has been found and preliminary plans are being drawn up, would replace Le Bourget, which is wanted for industrial and housing development, and would also be designated for supersonic transport operation, which the Authority feels should not be permitted to be too close to the city centre.

PASSENGER HANDLING AND COMMUNICATIONS

With the opening of the new Orly terminal, what has become known as "the Orly system" for passenger handling has been taken a stage further in Paris. Similar in many respects to the system universally employed at U.S. airports, it leaves responsibility with the passenger to catch his aircraft right up to the moment of departure.

Its application to international operations on a large scale has caused some problems and a good deal of criticism has been levelled at the new building by passengers accustomed to being shepherded to their aircraft. The "trickle" departure allowed by the Orly system is, in fact, essential if the planned peak capacity is to be handled in a building of this size. The system works as follows for outgoing passengers:—

1. Travel to Orly by car or taxi, or by the Air France bus service from the Invalides station.
2. Check in at the appropriate airline ticket desk on the ground floor. Registered baggage undergoes any necessary Customs check at this point and passes to the central baggage gallery at the rear of the building to be sorted according to destination. Passengers ascend to first-floor concourse; non-passengers accompanying them pay one new franc (1s. 9d.) for this privilege.
3. Check master indicator (controlled by punched cards prepared for each announcement) for departure channel. Departure is announced by loudspeaker 15 minutes before take-off and indicated by a red "Depart Imminent" sign on the master board; a second call is made five minutes before take-off.
4. Proceed from first-floor concourse to finger and departure gate, either direct for domestic flights, or by way of Customs and passport check for international flights. There is space provision for 17 of these control channels, each with a Customs officer and

From the concourse, international passengers pass through an immigration and Customs control point to reach the entrance to the finger and the departure gates.

Immigration officer, but not more than four are normally manned simultaneously at present. Immediately beyond these channels, the main departure board is duplicated, with a further small indicator over the particular gate to show the appropriate flight number. Passengers can move to the airside of the building at any time prior to departure and, if they wish, go up to the transit lounge on the second floor, with its bar, duty-free shops, church, children's corner and other amenities.

5. Depart along the finger to the appropriate gate number and wait in the small lounge at this gate to embark on the aircraft. The lounges, on the ground floor, are reached by a staircase from the upper-finger level; the finger itself is divided by a glass partition representing the frontier, with doors to each staircase from either side of the partition; automatic locking makes it possible to open only one door at a time, so that each gate can be used for either domestic or international flights. The finger is 820 ft. long.

Inbound passengers at Orly airport use the same channels in the reverse direction. When they reach the ground floor they pass into a baggage-claim area, the exit from which can be made only past Custom officers. Here, arrangements are made to "withdraw" passengers required for Customs examination, leaving the main stream to proceed without interruption.

Although the Le Bourget terminal building can scarcely rival the magnificence of that at Orly—with its three restaurants and two hotels—an attempt has been made to match "the Orly system" so far as passenger handling is concerned. This has involved the provision of a large departure-cum-transit lounge on the ground floor, entered when they wish by departing passengers by way of a Customs and Immigration check point. Le Bourget can be reached by Air France coach from Invalides, as well as by car, taxi or public transport. Adjacent to the front face of the building is a 250-car park, with meters, for parking up to one hour. For longer-term parking, there is a 600-car park, and spaces for another 1,200 cars in more distant parks intended chiefly for visitors to the public terraces on the roof of the building.

Situated astride the Route Nationale No. 7 (Paris-Fontainebleau), and connected by a special spur to the Great Southern Highway (a throughway), Orly is some 25 minutes by bus from the Invalides station in Paris. Peak-hour traffic in the centre of Paris increases this time, however. Le Bourget is less favourably placed, the bus from Invalides taking from 40 minutes to an hour, depending on traffic. It will, however, be linked in due course to the new Great Northern Highway, to reduce this time also to about 25 minutes. Air France is expected to close the Invalides station in five years' time and will move to a new headquarters in Montparnasse. Public transport to the two airports is meanwhile being improved, with bus services to Orly and Le Bourget from Denfert-Rochereau and Port Chapelle respectively, both the latter being termini for Paris Metro lines. Eventually, a monorail link may be considered for the Paris Nord Airport, but this also will be served by the Great Northern Highway.

ADMINISTRATION AND FINANCE

The two Paris airports, the heliport and 11 other small airfields in the Paris area, are administered by the Paris Airport Authority. This authority is a public agency, endowed with financial autonomy under French law. It is responsible to the Ministry of Public Works and Transportation, and supervised by the Ministry of Finance. It was created by an Ordinance on Oct. 24, 1945, and now directly employs some 1,650 persons. In addition, about 100 civil servants are seconded to the Authority and it controls—but does not employ—the technicians of the civil air navigation authority, who staff the control towers and other airways facilities.

The Authority is governed by a 24-member board of directors, of whom 12 represent the national government; five are members by virtue of holding particular offices in local authorities; three represent the personnel of the Authority itself; and four are designated for their competence in aviation affairs in general. The director-general and the chairman are government appointments.

The Authority is responsible for the provision and maintenance of all runways, aprons, airport lighting, terminal buildings, hangars and workshops. It also provides and maintains the facilities for air traffic control but, as noted above, does not staff these services. A commercial assistance service is offered to airlines using the Paris airports, and Authority personnel will be provided for all or any part of the passenger and baggage handling and aircraft servicing.

Accounts are kept by the Authority entirely separate from the French Government accounting system, and are balanced by means of a government subsidy, which is granted in accordance with total national policy to encourage all forms of transport, including air. The Authority received an initial endowment, in the form of usufruct on land, building and installations, estimated to be worth five billion old francs (approx. £3.65 million). Since then, capital expenditure has totalled NF570 million (approx. £41.6 million) with another NF80 million (approx. £5.84 million) budgeted in 1961, and some NF300 million (approx. £21.9 million) expected to be spent in the fourth quadrennial plan.

Most of the financing to date has been by loans from State agencies, guaranteed by the government. In all, some NF507 million (£37 million) has been borrowed, and the outstanding debt at the end of 1960 was NF500 million (£36.5 million), on which interest of approx. 6% is payable.

Income is derived from three principal sources: the so-called "aeronautic" charges (landing fees, beacon fees, aircraft parking fees and passenger head tax); rents and concession charges; ramp and handling services; and industrial operations, including the provision of heat, light and electricity. In 1960 the income from these sources amounted to NF68.6 (£5 million), to which was added NF3 million (£219,000) in payment for services given to government-owned aircraft, for a total of NF71.6 million.

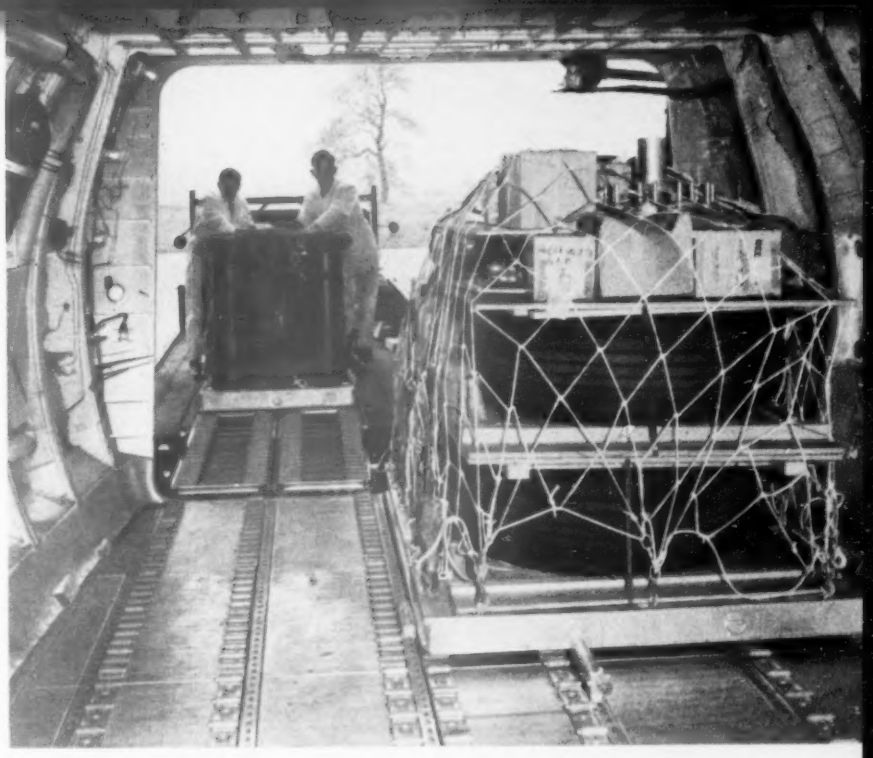
Total costs of Authority operations in 1960 exceeded this figure by NF15.6 million (£1.13 million) and included interest charges of NF31.85 (£2.32 million) and annual loan repayment of NF16 million (£1.17 million). The shortfall was made up by a direct Government subsidy.

A view down the finger at Orly, showing (right) one of the doors leading downstairs to the waiting room at the gate.

Airport Equipment . . . .

Creating An Air-cargo Industry

by H. A. Taylor



AFTER the conclusion of last month's resumed (and successful) IATA North Atlantic cargo rates conference the official statement included the comment that "the new rating system will transform the technological revolution in air transport into an economic revolution in distribution and marketing."

At first reading this sentence sounds suspiciously like gobbledegook, but, in fact, it summarizes—if in somewhat ingenious terms—the present situation of the air-cargo business.

We have, or are soon to have, the freighters which are as uncompromised as present operational and technical circumstances permit. The short-medium-haul A.W. Argosy is now in service with Riddle Airlines and will soon be in service with B.E.A.; the Canadair CL-44 swing-tail, medium-long-haul freighter is due to go into North Atlantic service with Seaboard World Airlines next month; and the Lockheed C-141 (MATS turbofan freighter, designed also to suit the civil operators) will be with us in 1964-65.

In the meantime, a large number of newly converted passenger aircraft have entered, or are entering, service—partly as a result of a growing belief in air-freight prospects, but partly, also, as an accidental by-product of the large-scale turbojet re-equipment programme which has made redundant so many big-capacity long-haul piston-engined aircraft.

Accidentally and otherwise, the available freight capacity is increasing. The North Atlantic routes have been the first to feel the impact of this increase in capacity, but regional operators will also, in due course, experience the beginnings of heavier competition to fill the holds of their aircraft.

The result will be a steadily increasing sales pressure on both shippers and consignees from various quarters. The carriers naturally have the primary responsibility for applying this pressure, but equally important, if more generalized, sales efforts have also been made by manufacturers (or prospective manufacturers) of cargo aircraft.

The present situation of the air-cargo business is symbolized by the contrasting photographs on this page. The heading picture shows pre-palletized loads entering the Argosy fuselage in a typical mechanized, all-freight operation. On the left, fill-up cargo is being shifted manually.

In their attempts to discover for themselves something about this curiously difficult air-cargo business, manufacturers in the U.S.A. and the U.K. have spent much money on studies of the air-cargo market and in trying to find out just how the patterns of trade and distribution may be modified to the advantage of everyone concerned. Within the next month or so, a European air-freight market survey is due to be published by Dr. K. R. Sealy of the London School of Economics; this has been produced in co-operation with the Transport and Economics Department of the A.T.S. Co., Hawker Siddeley Aviation's technical research organization.

There is, after all, no obvious advantage in air freight, as such, except in the comparatively limited number of cases where speed of delivery is of paramount importance—cases on which the restricted air-freight business has, so far, been largely built.

The time has come now to demonstrate ways in which air transport can show positive overall cost and other advantages—to the all-important consumer as well as to the manufacturer and the dealer—through economies in packing, insurance, distribution networks and warehousing, and in the release of the working capital which is at present wastefully trapped in storage and in the various surface-transport pipelines. It will be a big job—but one which may grow more easy as the prospective customers learn from each other in a healthily competitive world.

So far there has been a tendency in the air-cargo business to suppose that a simple lowering of the freight rates will be the crucial factor in air-cargo development. Obviously the high cost, as seen in the tariff sheets, is a cause of initial resistance. But the air rates are unlikely ever to be as low as they are even for overland surface transport—so this cost objection will always apply to a greater or smaller degree.

But the cargo-sales emphasis is now laid on comparisons between the *real* costs of the two forms of transport—a very different matter—and on the breaking-down of resistance to the reorganization which will be necessary before the regular use of air freight can actually save money for all its users. Clearly the sales effort will always be helped by rate reductions—and probably even more so by simplifications of the rate structure—but cuts, unless prohibitively spectacular, are unlikely, by themselves, ever to provide the main incentive to shippers and consignees except in the case of comparatively small, irregular loads.

These consignments are now, in one specialist's view, considered to be a "menace" rather than a help to the serious cargo carrier. The introduction of bulk reductions—such as the somewhat half-hearted weightbreaks approved for the North Atlantic—will gradually squeeze out the small consignments, which will tend, more and more, to be looked after by the professional consolidator of shipments.

The North Atlantic route has become, by tradition, that on

which fare and rate reductions are tried out before application, a year or two later, in other areas. The situation on this route is by way of being unique in many ways—not the least important being the simple fact that, when the near circular-section fuselage of a turbojet is bisected by an adequately wide passenger floor, there is, inevitably, a lot of space below this floor. But the battle of the North Atlantic freight rates has more than one lesson to offer.

Although the new rates—complete with six weightbreaks and a simplified special-commodity pattern—which will come into force for 18 months' application on Sept. 1, are very much a compromise (and possibly an unhappy one for all sides), they demonstrate the way in which individual carriers with positive plans can always get at least a part of their way even in a unanimous-decision environment.

But the difficulties in reaching even a compromise decision at Montreal after the failure at Paris show clearly that there is an unbridgeable gulf between the fill-up cargo and the genuine all-freight businesses. The primarily passenger carriers are likely always to prefer the highest possible standard rates, coupled with various forms of commodity incentive rates, while the all-freight carriers must necessarily depend for their survival on the big increases in traffic which can only be derived from a carefully planned bulk-reduction system.

The hard fact remains that the all-cargo business is not yet self-supporting and depends for its survival on revenue from other more directly profitable sources, such as military contracts and passenger charter. The converted long-haul freighters cannot be made to pay their way even on present average rates except at very high load factors. It is only the specialized freight aeroplanes, such as the CL-44 and the Argosy, which, with the vital help of efficient loading and unloading equipment and systems, will be able to break the vicious circle and get the business moving.

B.E.A.'s All-freight Plans

THE purchase of three A.W. Argosies by B.E.A. may well, in due course, be remembered as the starting point of a more intensive development of air-freight services in Europe. None of these operations has so far been profitable in their own right, but it is clear that, if B.E.A.'s future services—using this uncompromised short-medium haul freighter and the cargo-handling systems which go with it—show any reasonable signs of economic success, there will be a revaluation of the situation in other quarters. Which will be a good thing for the air-cargo business and—because of the inevitable snow-ball effects in any new undertaking—a good thing also for B.E.A.

For the moment, however, the Corporation is probably the only intra-European carrier with the kind of existing air-freight business and route network on which more intensive operations can economically be built.

Until the past year or two the trouble for B.E.A. has been one that plagues all scheduled freight operators—the fact that so much of the traffic was unidirectional and that, consequently, the overall load factors were too low for profitability. Two years ago it seemed that the business was not likely, even with the best of equipment, to be financially rewarding unless and until the forms of bilateral agreement—which had been devised for the benefit of passenger carriers—were replaced by others with fifth freedom rights which, on an area basis, would permit operations over triangular routes in the direction of the major cargo traffic flows.

More recently this situation—which is equivalent to that of the seasonal peaks and troughs in passenger operations—has been improving and the latest figures show a reasonably well-balanced flow on the more important routes. In 1959-60 the export/import ratio in and out of the U.K. was approaching 50 : 50, and, even when newspaper loads were included, the ratio was as good as 56 : 44 in favour of exports. Even so, it remains to be seen whether, if the U.K. joins the Common Market, "circuit" rights will be successfully negotiated, or whether, in the long term, the Air Union members will come to some suitable mutual agreement.

So far as B.E.A. is concerned, it might have been supposed that the Vanguard, with its big prospective under-floor cargo capacity, would have reduced the more immediate need for an all-freight fleet. In fact, the high passenger-load routes over which the Vanguard can economically be operated are not necessarily those on which there is useful freight traffic. London-Paris is one of the few exceptions; but even on this route there will be continued need for all-freight services because the high-frequency passenger services are during the day, while the majority of cargo loads must be moved at night.

The Corporation's future Argosy operations will be developed naturally from the present all-cargo services with convertible Viscount 802s and DC-3 freighters and will, initially (and sensibly) be minimal. Later, if all goes well, an option on additional Argosy 200s will be taken up, but, even with a minimum fleet of three aircraft (two in service and one on maintenance) and assuming a "natural" traffic increase at present cargo rates, B.E.A. estimates that the operations will do rather better than break even.

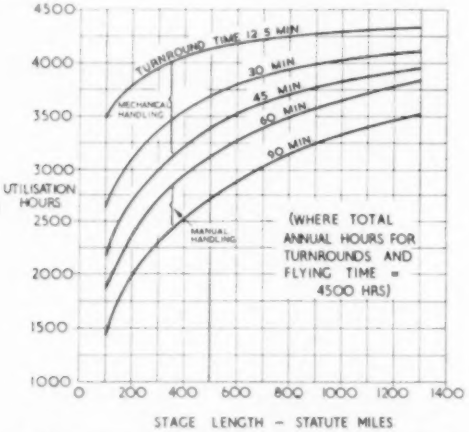
Success depends on the co-ordination of cargo-service network timings, on freedom from technical difficulties which will make these timings possible, and on fast turnrounds. It is hoped that an initial average utilization of 1,800 hr. will be built up to 2,200-2,300 hr. per annum—which is about the maximum to be expected, by way of a starting target, on a network in which the average stage length is about 300 naut. miles.

The manufacturers of the Argosy can show, in studies worked out in co-operation with B.E.A., the way in which a shortening of turnround times can make all the difference to the utilization on which prospective profits depend. Diagrams on these pages demonstrate the potential value of pre-palletized Rollamat loading and unloading more clearly than any number of words. The full system involves the use of a simple transfer bridge, two or more Rollamat-equipped standard flat-platform lorries and some form of loading dock.

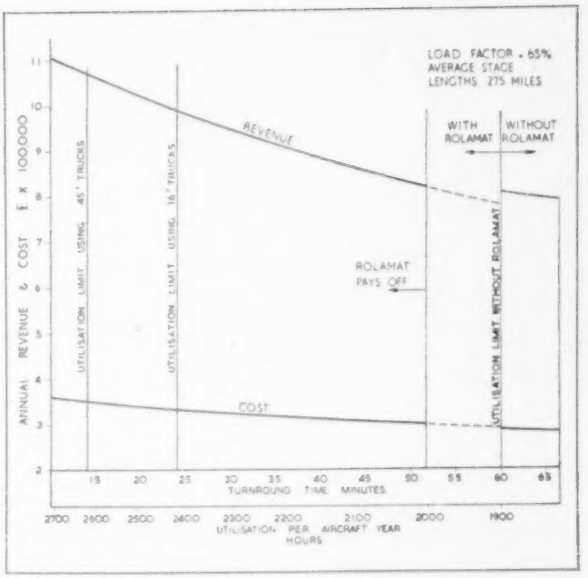
With this kind of equipment, used for simultaneous loading and unloading, it can be shown that turnround times can be reduced to 15 minutes or less and that utilization, over a series of 400-mile sectors, can be developed up to the 4,000 hr. per annum level.

All this presupposes traffic flows and route systems which permit the maximum operation of a fleet of aircraft. B.E.A.'s earlier thoughts were to the effect that a complete handling system (or something like it) would be economically worth while only at a later stage in the operation—except, perhaps, at London Airport. There appeared to be no financial advantage to be gained in re-equipping, at considerable cost, the outstations.

The Corporation has more recently come to the conclusion that turnround time-saving, even in the earlier period of its all-freight operations with Argosies, will be worth while—if only in active preparation and practice for future traffic-handling requirements. Special supplementary equipment, such as flat-bed lorries prepared for Rollamat installation and transfer bridges, is to be made available for use at certain key outstations.



This diagram shows graphically the effect of speed of turnround on the potential utilization and productivity of the Argosy. An average 12-hour working day is assumed—permitting a maximum possible annual utilization of 4,500 hours for flying and turnrounds. Capacity loadings and unloadings are assumed throughout.



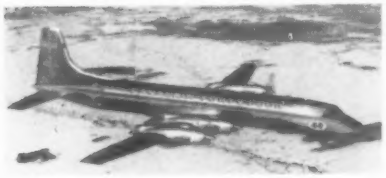
Right, the effect of turnround time on the Argosy's potential profitability. It will be seen that the payload/revenue loss incurred by the use of Rollamat loading equipment is recouped at all turnround times less than 52 min.—times which are possible only when using a mechanized system. The optimum turnrounds assume the simultaneous use of two special 45-ft. platform vehicles; with three standard 16-ft. lorries a turnround time of 24 min. is possible.

B.E.A.'s present all-freight service timings will be modified as necessary to permit the Argosy schedules to be developed for maximum utilization. For instance, the domestic freight services will be scheduled earlier in the evening, so that the aircraft can afterwards fly on into Europe from London.

Exclusively Argosy operations are planned for the all-freight services from London to Milan (approximately four a week by day) and to Copenhagen (six a week); from Manchester to London (six a week, three coming through from Scotland and three from Ireland); and for a round-trip German network (six a week). On the London-Paris run the Argosy services will be supplementary to those by Viscount 802; the present York schedules will cease. The seasonal London-Jersey service will be operated by Argosy all the year round, but on a limited frequency. Viscount 802s will continue to operate the London-Brussels and London-Amsterdam services.

B.E.A.'s first two Argosies are due to be delivered in October for initial services in November—probably starting on the Copenhagen run. The third Argosy will be delivered in January. The DC-3 freighters will be retired early in 1962 and will be out of operation by Apl. 1.

The Specialist Freight Carrier's Dilemma



AS the one scheduled freight-only operator over the North Atlantic, Seaboard World Airlines has problems and plans which demonstrate something of the dilemma for the all-cargo carrier in the present stage of vigorous immaturity in the air-freight business.

Seaboard operates 12 return all-cargo services a week between the U.S.A. and Europe, nine of them through London; it has ordered five swing-tail Canadair CL-44s; and it has recently moved into its own cargo-handling and clearance warehouse on the south side of London (Heathrow) Airport. The first of the CL-44s is due to go into operation next month, and the new cargo accommodation—in one of the three bays of the so-called "alloy" hangar—has been in regular use since Jne. 1.

Here the carrier has ample floor area, full Customs facilities and freedom to develop the most efficient freight organizing and handling systems. Already, even while using conventional methods of shipment-preparation and loading with the L-1049Hs, the effects of 18,000 sq. ft. of floor and freedom of action have almost halved the loading times. When the CL-44s are in service and loads can be pre-palletized, fork-lifted on to the special transfer platform and winched into the aircraft's main hold, the total loading time will be reduced to the order of 60 minutes for a 30-ton payload.

The CL-44 is potentially capable of giving its user the chance to break even on a 65% load factor at an average revenue rate of 18 cents per ton-mile—about 30% below the present average freight rate. Seaboard's plans provide a good example of the use of modernized mechanics in the air-freight business, and of the way in which one particular operator is preparing to get the best possible results from improved equipment and terminal organization.

But the problems for scheduled all-freight operators go beyond the need for maximum operational efficiency—and even beyond the need for a maximum sales-education effort among the various potential customers.

In a speech delivered at New York University's International Air Transport Seminar last March, the president of Seaboard, Mr. Richard M. Jackson, commented on a number of the characteristics which are peculiar to this branch of the airline operating industry.

For instance, the type of route structure which suits the passenger business will by no means necessarily suit the all-cargo carrier. About 95% of air passengers eventually complete a return trip—so that almost every customer is contributing to the revenue on inbound as well as on outbound segments. Cargo, on the other hand, *never* flies a round trip.

All-cargo operators should be permitted to fly always in the directions in which commerce flows; services should be certificated on an area basis so that "triangle-trade" routes can be flown, and, as a matter of course, full fifth-freedom rights should be granted. Air cargo is an industrial service and not, like passenger travel, a consumer service.

Mr. Jackson continued: "The all-cargo carriers, as immature as they are, find themselves living in an adverse competitive climate. No certificated airline has ever made any money in the common carriage of freight in all-cargo airplanes on a continuing basis. The passenger carriers that operate all-cargo airplanes can do so only because of surplus revenues from the passenger business. The competitive gap between the freighter business and the 'belly cargo' business must be reduced so that the cargo carriers either are permitted to provide some of the basic services that the passenger carriers provide, or they must be allowed to provide services that passenger carriers cannot provide.

"Specifically, I have in mind a proposal that Seaboard has recently submitted to the Civil Aeronautics Board. This is called the 'Passenger Top-Off Proposal.' Since the passenger carriers are primarily interested in carrying passengers, and 'top-off' with cargo, it certainly seems fair and reasonable to permit the all-cargo carriers to carry cargo and to 'top-off' with passengers.

"The cabin of the CL-44 is divided into 10 pallet areas and each pallet can carry 6,500 lb. of cargo. It may be quite a while before the CL-44 operators are able to achieve more than an average load of six pallets of cargo. In this hypothetical example, four pallet areas would be empty.

"We have developed a plan for permanently attaching approximately 14 conventional economy-type seats to each pallet . . . thus, with an additional 10 seats already installed in the non-palletized area in the swing tail, making a total of 66 available seats.

"The economics involved in this plan are as follows: If we assume that the six pallets loaded with cargo will total 36,000 lb., the revenue derived from the cargo (assuming a modest reduction in cargo rates) should total about $14,500 for a 4,000-mile trip, New York to Frankfurt. The estimated fully allocated cost of that flight is slightly less than that figure. If 50 of the seats were sold to passengers at $145 each, an additional $7,250 of revenue would be accrued, or a 50% profit on the operation.

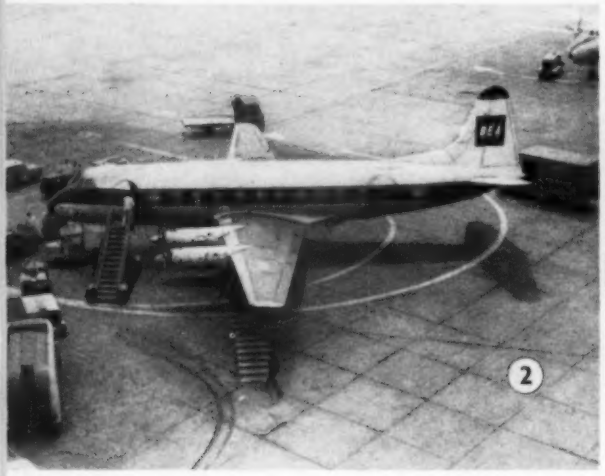
"As with the passenger carriers, it is important that the 'top-off' source of revenue should not yield a greater unit return than the primary source of revenue. In our proposal a pallet fully loaded with passengers will return approximately

(*Continued on page 764*)

45-minute Turn-round

A series of pictures taken at London Airport last week by staff photographer Maurice Rowe, showing the sequence of events on the apron as a Viscount 700 is "turned-round." Times quoted are minutes and seconds before and after the brakes-on time.

—0.30 Flight BE 8819 arrives from Manchester at the No. 3 aircraft stand, alongside the front face of the No. 1 passenger building, two minutes after touchdown on Runway 28L.



+ 0.35 The main passenger door is opened, and the servicing vehicles converge. By the nose is the tug for the passenger stairs, the power supply truck and toilet servicing truck.

+ 1.30 The 61 passengers disembark. The baggage truck (top centre) is backed up, freight vans move in past the nose and tail, and the cleaning vehicle (front left) waits its turn.

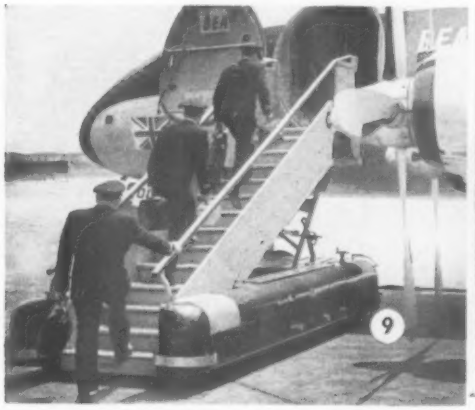
+ 8 Baggage away. The last passenger disembarked at + 4.45 and the crew left at + 6. Cleaning, inside and out, has started.

+ 10 Routine checks and minor servicing proceeds.

+ 12 Inside the cabin, three cleaners tidy-up with vacuum cleaners.

+ **13** Essential attention is given to both sides of the windscreen.

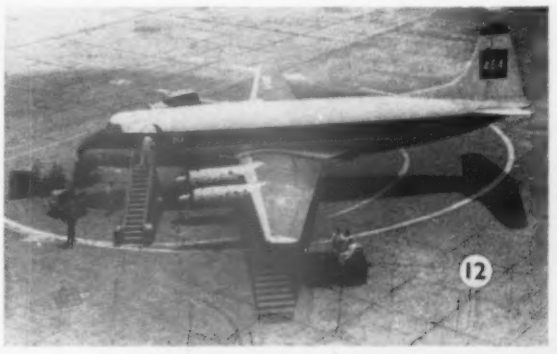
+ **16** The fuel hoses are run out, one to each wing. The aircraft arrived with 400 gallons in its tanks, and takes on 500 gallons at London.



+ **21** The crew goes on board and starts the pre-flight checks, including a walk-around inspection by the captain.

+ **31** Baggage arrives. The flight clerk is now on board; fuelling and cleaning are complete.

+ **35** Passengers walk to the aircraft, led by a traffic clerk. This flight is all-tourist and only the front entrance door is used.



+ **42** The door is closed after adjustment of the ship's papers to cover one "missing" passenger who failed to appear after checking in at the West London Air Terminal.

+ **46** Flight BE 8824 departs for Manchester exactly on schedule. Airborne from Runway 28R at + 50.

(*Continued from page 761*)

$2,000, or 70% of the revenue obtained from a full pallet of cargo. A suggested ticket price of $133 to London, for example, is representative of the middle of the air-cargo rate system, at 33.8 cents per ton-mile, giving allowance for 66 lb. of free baggage."

In his concluding comments Mr. Jackson put the position unequivocally when he suggested that, though the "purists" might prefer the cargo operators to stay exclusively in this field in order "to prove or disprove the theory that air cargo has a great future . . . the hard facts of life are that all-cargo carriers must have supplemental income in order to live long enough to achieve the self-sustaining status that will result from expansion of the industry."

* * *

By way of postcript—and to indicate something of the immensity of the task and the need for full co-ordination if air freight is to be developed so as to provide the next prospect of a major expansion for air transport—here are some pertinent quotations from a Boeing company paper ("Trends in Air Cargo") presented earlier this month at the I.A.S./A.R.S. joint meeting in Los Angeles:

"We see the necessity for tackling two problem areas of major proportions. The first of these . . . involves the acquisition and analysis of factual data on domestic and international freight movement as a basis for determining the source and potential volume of new traffic and for defining competitive factors in respect to other modes of transport. . . .

"The second problem area deals with equipment requirements. It involves the collection of authoritative data representing industry-wide experience in providing cargo service and deriving therefrom a valid appreciation of all-cargo market requirements. Ideally, the ultimate objectives are not only to design aircraft to fit the requirements, but also to describe the system within which the aircraft will function. . . .

"We believe that future growth of the air cargo industry is going to depend on how well prepared both operator and manufacturer are with the facts and judgment arrived at from research in these problem areas. . . .

". . . generally this kind of information seems to be closely held for proprietary or competitive reasons and generated strictly on an individual airline basis. Obviously, to arrive at any conclusions on common requirements, the collective experience of the airline operators, or a reasonable cross-section of them, has to be analysed.

"We propose that the major carriers and manufacturers implement a co-operative research programme through a private transportation research institution honouring proprietary rights. . . .

". . . The problem that confronts all concerned is how to join forces and meet the challenge of creating an air-cargo industry. Co-operative fact-finding and research will provide the basis for reasonable decisions."

Doing it the Hard Way

These pictures demonstrate the restrictions and difficulties under which the operators of converted passenger aircraft necessarily have to work and why turnround times can never be economically short when using such equipment. Above, a Beech Debonair is loaded into an L-1649A; left, a powerplant is forklifted into an L-1049H. The other two pictures show the loading doors of a DC-7F (right) and a DC-6A.

441

LIVES SAVED TO DATE BY MARTIN-BAKER EJECTION SEATS

M·B·A

Tyres, wheels and brakes on the

AVIATION TRADERS ATL 98 CARVAIR

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GOODYEAR

SERVING AVIATION THE WORLD OVER

Airport Equipment . . . .

Equipment and Installations

A quick-reference guide to British companies associated with airport construction, and manufacturers of fixed installations and portable equipment for airport use

AIRPORT CONSTRUCTION : *Runways, Terminals and Hangars*

Bellman Hangars, Ltd., 38 Cornwall Gardens, London, S.W.7.
Bolton Gate Co., Ltd., Waterloo Street, Bolton, Lancs.
British Insulated Callender's Construction Co., Ltd., 30 Leicester Square, London, W.C.2.
British Reinforced Concrete Engineering Co., Ltd., Lichfield Road, Stafford.
Conder Engineering Co., Ltd., Winchester, Hants.
Richard Costain, Ltd., 111 Westminster Bridge Road, London, S.E.1.
Dawnays, Ltd., Steelworks Road, Battersea, London.

A Blackburn Palouste turbo-starter mounted on a 15-cwt. Commer vehicle for Pan American.

A Douglas Tugmaster aircraft tractor in service with Qantas.

En-Tout-Cas Co., Ltd., Thurmaston Works, nr. Leicester.
Esavian, Ltd., Esavian Works, Stevenage, Herts.
S. M. D. Hawksley, Ltd., 2 Buckingham Avenue, Slough, Bucks.
Head Wrightson Aluminium, Ltd., Stockton Forge Works, Norton Road, Stockton-on-Tees.
John Laing and Son, Ltd., London, N.W.7.
Sir Robert McAlpine and Sons, Ltd., 80 Park Lane, London, W.1.
Procter Bros. (Wireworks), Ltd., Monkbridge Mills, Whitehall Road, Leeds, 12.
Westland Engineers, Ltd., Yeovil, Somerset.
George Wimpey and Co., Ltd., Hammersmith Grove, London, W.6.

FIXED INSTALLATIONS : *Approach, Runway, Taxi and Apron Lighting*

Butlers, Ltd., Atlantic Works, Grange Road, Small Heath, Birmingham, 10.
Ceag, Ltd., Queen's Road, Barnsley, Yorks.
Engineering and Lighting Equipment Co., Ltd., Sphere Works, Campfield Road, St. Albans, Herts.
The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
Harley Aircraft Landing Lamps, St. Neots, Huntingdonshire.
Holophane, Ltd., Elverton Street, London, S.W.1.
C. Maurice Contractors, Ltd., Lindsey Road, Bishop's Stortford, Herts.
Revo Electric Co., Ltd., Tipton, Staffs.
Stone-Chance, Ltd., Gatwick Road, Crawley, Sussex.
Thorn Electrical Industries, Ltd., Gt. Cambridge Road, Enfield, Middx.

FIXED INSTALLATIONS: *Communications, Navaid and Meteorological Equipment*

Airmec, Ltd., High Wycombe, Bucks.
British Communications Corporation, Ltd., Coronation Road, High Wycombe, Bucks.
Burndept, Ltd., West Street, Erith, Kent.
Cossor Communications Co., Ltd., Cossor House, Highbury Grove, London, N.5.
Cossor Radar and Electronics, Ltd., The Pinnacles, Elizabeth Way, Harlow, Essex.
Creed and Co., Ltd., Telegraph House, Croydon, Surrey.
The Decca Navigator Co., Ltd., Decca House, 9 Albert Embankment, London, S.E.11.
Decca Radar, Ltd., Decca House, 9 Albert Embankment, London, S.E.11.
Ekco Electronics, Ltd., Ekco Works, Southend-on-Sea, Essex.
Elliott Brothers (London), Ltd., Boreham Wood, Herts, and The Airport, Rochester, Kent.
E.M.I. Electronics, Ltd., Hayes, Middx.
Ferranti, Ltd., Hollinwood, Lancs.
The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
Hills Bros. (Service), Ltd., Beaconsfield Road, Acton Green, W.4.
International Aeradio, Ltd., 40 Park Street, London, W.1.
Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex.
Mechanism, Ltd., George Street, Croydon.
Muirhead and Co., Ltd., Beckenham, Kent.
Mullard Equipment, Ltd., Mullard House, Torrington Place, London, W.C.1.
R. W. Munro, Ltd., Bounds Green, London, N.11.
Murphy Radio Ltd., Bessemer Road, Welwyn Garden City, Herts.
Negretti and Zambra, Ltd., 122 Regent Street, London, W.1.
The Plessey Co., Ltd., Ilford, Essex.
Pye, Ltd., Cambridge.
Racal Engineering, Ltd., Western Avenue, Bracknell, Berks.
Redifon, Ltd., Broomhill Road, London, S.W.18.
Short and Mason, Ltd., 280 Wood Street, London, E.17.
Simon Equipment, Ltd., 48 George Street, Portman Square, London, W.1.
Standard Telephones and Cables, Ltd., Connaught House, 63 Aldwych, London, W.C.2.
Stratton and Co., Ltd., Eddystone Works, Alvechurch Road, West Heath, Birmingham.
Thermionic Products (Electronics), Ltd., Shore Road, Hythe, Southampton.
Ultra Electronics, Ltd., Western Avenue, London, W.3.
W. S. Electronics, 44 Brunel Road, London, W.3.

APRON EQUIPMENT : *Aircraft Towing and Starting*

Aero Maintenance Equipment, Ltd., 12 Bruton Street, London, W.1.
Aircraft Ground Equipment, Ltd., Blackswarth Road, Bristol, 5.
Associated Electrical Industries (Rugby), Ltd., Rugby.
Atlas Copco (Great Britain), Ltd., Maylands Avenue, Hemel Hempstead, Herts.
Auto Diesels, Ltd., Braby House, Smithfield Street, London, E.C.1.
Blackburn Engines, Ltd., Brough, Yorks.
David Brown Construction Equipment, Ltd., Meltham, Huddersfield, Yorks.
Douglas Equipment, Ltd., Tewkesbury Road, Cheltenham.
Houchin, Ltd., Garford Works, Chart Road, Ashford, Kent.
I.V. Pressure Controllers, Ltd., Atlas House, 683 London Road, Isleworth, Middx.
Lansing Bagnall, Ltd., Basingstoke, Hants.
Mercury Truck and Tractor Co., Ltd., The Quay, Gloucester.

The Esso fuel storage facilities at London Airport include a number of Automotive Products Purolator bulk filter/water separators, each with a capacity of 300-500 g.p.m.

Airport Equipment . . . .

MUREX WELDING PROCESSES, LTD., Waltham Cross, Herts.
PARTRIDGE, WILSON AND CO., LTD., Davenset Electrical Works, Evington Valley Road, Leics.
PETBOW, LTD., Sandwich, Kent.
RED DEVON, LTD., Seymour Wharf, Totnes, S. Devon.
R.F.D. CO., LTD., Godalming, Surrey.
S. GRAHAME ROSS, LTD., Quarry Lane, Whyke, Chichester, Sussex.
ROVER GAS TURBINES, LTD., New Meteor Works, Lode Lane, Solihull, Warwickshire.
UNIVERSAL POWER DRIVES, LTD., Aintree Road, Perivale, Greenford, Middx.
VERNONS INDUSTRIES, LTD., Kirkby Industrial Estate, Liverpool.
WALES AND EDWARDS, Wyle Cop, Shrewsbury, Shropshire.
WESTINGHOUSE BRAKE AND SIGNAL CO., LTD., 82 York Way, London, N.1.
WILLIAMS AND JAMES (ENGINEERS), LTD., Chequers Bridge, Gloucester.

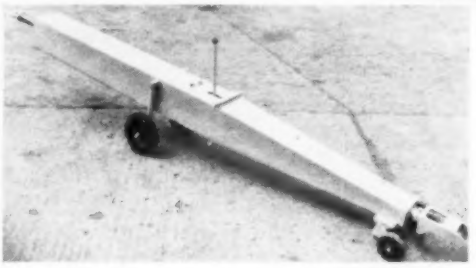
APRON EQUIPMENT: ***Aircraft Servicing and Fuelling***

ACCESS EQUIPMENT, LTD., Maylands Avenue, Hemel Hempstead, Herts.
AERO CONTROLS, LTD., Industrial Estate, Weedon Road, Northampton.
AUTOMOTIVE PRODUCTS CO., LTD., Tachbrook Road, Leamington Spa, Warwick.
AVERY-HARDOLL, LTD., Oakcroft Road, Chessington, Surrey.
W. B. BAWN AND CO., LTD., Byron Works, Blackhorse Lane, London, E.17.
DEXION, LTD., Maygrove Road, Kilburn, London, N.W.6.
DRAGONAIR, LTD., Fitzherbert Road, Farlington, Portsmouth.
EXACTOR, LTD., Church Way, Edgware, Middx.
FLIGHT REFUELLING, LTD., Tarrant Rushton Airfield, Blandford, Dorset.
SIR GEORGE GODFREY AND PARTNERS, LTD., Hampton Road West, Hanworth, Middx.
THOS. P. HEADLAND, LTD., 10 Melon Road, London, S.E.15.
H.M.L. ENGINEERING, LTD., Harpers Yard, St. John's Road, Isleworth, Middx.
A. T. JUNIPER, LTD., Mapledale Works, Mapledale Road, Liverpool, 18.
LAKE AND ELLIOT, LTD., Braintree, Essex.
MERCURY AIRFIELD EQUIPMENT, LTD., The Quay, Gloucester.
M.L. AVIATION CO., LTD., White Waltham, Berks.
RELLUMIT (LONDON), LTD., Chandos House, Palmer Street, London, S.W.1.
SARO (ANGLESEY), LTD., Beaumaris, Anglesey.
SIMON ENGINEERING (MIDLANDS), LTD., Queens Cross, Dudley, Worcs.
SKYHI, LTD., Culwell Works, Heath Town, Wolverhampton.
STANHAY (ASHFORD), LTD., Elwick Works, Ashford, Kent.
THE STEEL BARREL CO., LTD., Uxbridge, Middx.
STREAM-LINE FILTERS, LTD., Henley Park, Normandy, nr. Guildford, Surrey.
TECALEMIT, LTD., Plymouth, Devon.
TEMPLEWOOD HAWKSLEY, LTD., 2 Buckingham Avenue, Slough, Bucks.
THOMPSON BROS. (BILSTON), LTD., Bradley Engineering Works, Bilston, Staffs.
TRURO ENGINE WORKS, LTD., Morden Road, South Wimbledon, London, S.W.19.
WAYNE TANK AND PUMP CO., LTD., Western Road, Bracknell, Berks.
ZWICKY, LTD., Buckingham Avenue, Trading Estate, Slough, Bucks.

APRON EQUIPMENT: ***Passenger and Freight Handling***

AIRTECH, LTD., Aylesbury (Thame) Airport, Haddenham, Bucks.
AUSTIN CROMPTON PARKINSON ELECTRIC VEHICLES, LTD., Morrison Works, South Wigaton, Leicester.
AVIATION TRADERS (ENGINEERING), LTD., 21 Wigmore Street, London, W.1.
A. W. EQUIPMENT, LTD., Hucclecote, Glos.

A Conveyancer fork lift truck being used to lift a baggage trailer to aircraft loading height.



A Morfax tow-bar for the Vickers Vanguard. The basic design is available in lengths from 16 ft. to 30 ft. and will suit tractor hook heights from 16 in. to 36 in.

BROWN BROTHERS (AIRCRAFT), LTD., Bedford Road, Northampton.
CARGO AIDS, LTD., Station Works, Westhall Road, Upper Warlingham, Surrey.
CONVEYANCER FORK TRUCKS, LTD., Liverpool Road, Warrington, Lancs.
H. W. EDGHILL AND CO., LTD., Odiham Road, Hook, nr. Basingstoke.
FOURWAYS (ENGINEERS), LTD., Thornwood Common, Epping, Essex.
HESTON AIRCRAFT AND ASSOCIATED ENGINEERS, LTD., Heston Airport, Hounslow, Middx.
I.T.D., LTD., Webb Lane, Hall Green, Birmingham.
KING AIRCRAFT CORPORATION, Cameron Street, Hillington, Glasgow, S.W.2.
LISTER GROUP, Dursley, Gloucestershire.
HERBERT MORRIS, LTD., Loughborough, Leics.
MORFAX, LTD., Willow Lane, Mitcham, Surrey.
PRECISION ENGINEERING PRODUCTS, LTD., Bury St. Edmunds.
ROLLASON AEROCESSORIES, LTD., Croydon Airport, Surrey.
SAMLESBURY ENGINEERING, LTD., Samlesbury Airfield, Blackburn, Lancashire.
SHORT BROS. AND HARLAND, LTD., Queens Island, Belfast.
SPURLINGS, LTD., Edgware Road, The Hyde, Hendon, London, N.W.9.
C. F. TAYLOR (METAL WORKERS), LTD., Wokingham, Berks.
TYNE TRUCK AND TROLLEY CO., LTD., First Avenue, Team Valley Estate, Gateshead-on-Tyne, 11.
WATFORD ELECTRICAL AND MANUFACTURING CO., LTD., Whippendell Road, Watford, Herts.
WESSEX INDUSTRIES (POOLE), LTD., Dolphin Works, West Street, Poole, Dorset.

AIRPORT EQUIPMENT: ***Fire Fighting, Cleaning, Noise Protection, etc.***

A.F.P. ENGINEERING, LTD., 28 Victoria Street, London, S.W.1.
AIRMED, LTD., Edinburgh Way, Harlow, Essex.
AMPLIVOX, LTD., Beresford Avenue, Wembley, Middx.
GEORGE ANGUS AND CO., LTD., Angus House, Newcastle upon Tyne.
ANTICOUSTIC CO., LTD., 7 Mill Mead, Guildford, Surrey.
BELL'S ASBESTOS AND ENGINEERING, LTD., Bestobell Works, Slough, Bucks.
THE BRITISH ROTARY SNOWPLOUGH CO., LTD., 271 Uxbridge Road, London, W.12.
J. BROCKHOUSE AND CO., LTD., Victoria Works, Hill Top, West Bromwich, Staffs.
COVENTRY CLIMAX ENGINES, LTD., Widdrington Road, Coventry.
CULLUM DETUNERS, LTD., The Acoustic Centre, 58 Highgate West Hill, London, N.6.
FIRE ARMOUR, LTD., 9 George Street, Baker Street, London, W.1.
GENERAL FIRE APPLIANCE CO., LTD., St. Florian House, George Street, Croydon, Surrey.
THE GLOSTER AIRCRAFT CO., LTD., Gloucester, Glos.
INDUSTRIAL ACOUSTICS CO., LTD., Victor House, Norris Road, Staines, Middx.
THE WALTER KIDDE CO., LTD., Lux Works, Belvue Road, Northolt, Middx.
LACRE, LTD., Hatfield Road, St. Albans, Herts.
LEWIN ROAD SWEEPERS, LTD., Victoria Works, Hill Top, West Bromwich, Staffs.
MERRYWEATHER AND SONS, LTD., Greenwich High Road, London, S.E.10.
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THE PYRENE CO., LTD., Great West Road, Brentford, Middx.
ROLBA CO., LTD., 88/92 Rochester Row, London, S.W.1.
SCAMMELL LORRIES, LTD., Watford West, Herts.
SIEBE GORMAN AND CO., LTD., Davis Road, Kingston By-pass, Surbiton, Surrey.
THE SUN ENGINEERING (RICHMOND), LTD., 45-49 Cambridge Road, Kingston-on-Thames, Surrey.
ZWICKY, LTD., Buckingham Avenue, Trading Estate, Slough, Bucks.

Dexion slotted angle in use for a Viscount servicing platform.

FUEL AND OIL SUPPLIERS

THE BRITISH PETROLEUM CO., LTD., Britannic House, Finsbury Circus, London, E.C.2.
CASTROL, LTD., Castrol House, Marylebone Road, London, N.W.1.
ALEXANDER DUCKHAM AND CO., LTD., Hammersmith, London, W.6.
ESSO PETROLEUM CO., LTD., 50 Stratton Street, London, W.1.
GULF OIL (GREAT BRITAIN), LTD., 6 Grosvenor Place, London, S.W.1.
MOBIL OIL CO., LTD., Caxton House, Westminster, London, S.W.1.
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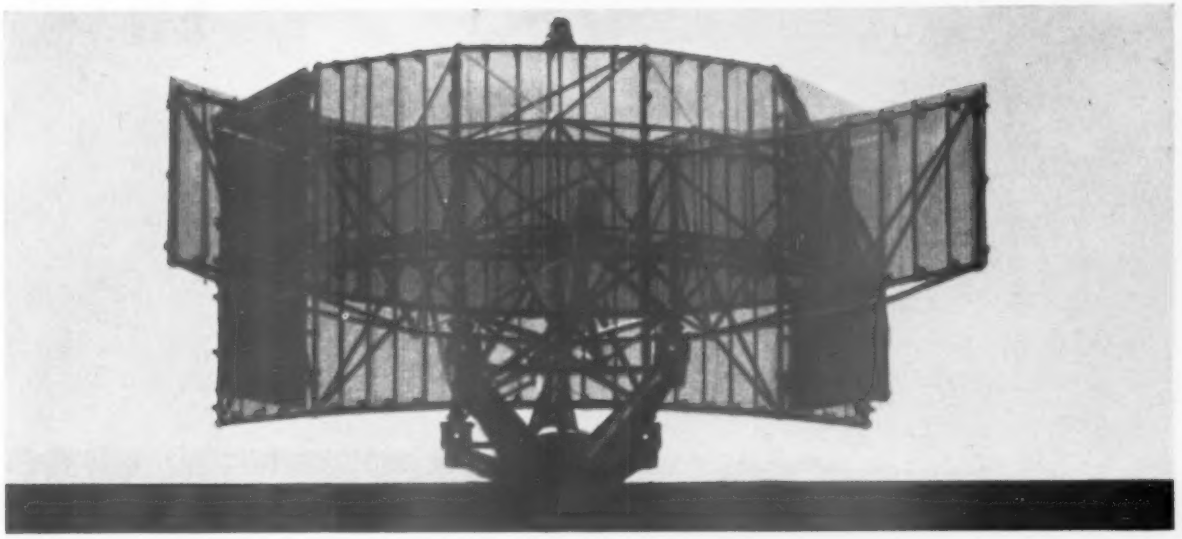
THE ROYAL DUTCH/SHELL GROUP OF COMPANIES, St. Helen's Court, Great St. Helen's, London, E.C.3.
SHELL-MEX AND B.P., LTD., Shell-Mex House, Strand, London, W.C.2.



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DASR-1

FIRST LONG RANGE CIVIL RADAR IN SOUTH AMERICA

Maiquetia Airport, Venezuela, is the site of the latest installation of the Decca DASR-1 civil surveillance radar. This key installation at one of the main staging centres on the air route between North and South America will be used to control dense air traffic of all types operating in and out of this first-class modern airport.

DASR-1 is a 10 cm., twin beam radar system specially designed to meet the exacting requirements of air traffic control authorities in congested and difficult regions, where jet and turbo-prop airliners are operating and where the risk of encountering small military aircraft must be guarded against.

DASR-1 is a high discrimination, high data rate radar with absolutely constant and gapless coverage through 360°. Performance exceeds 100 miles at 37,500 feet against a small airliner (ICAO standard 10 m² target).

DECCA RADAR

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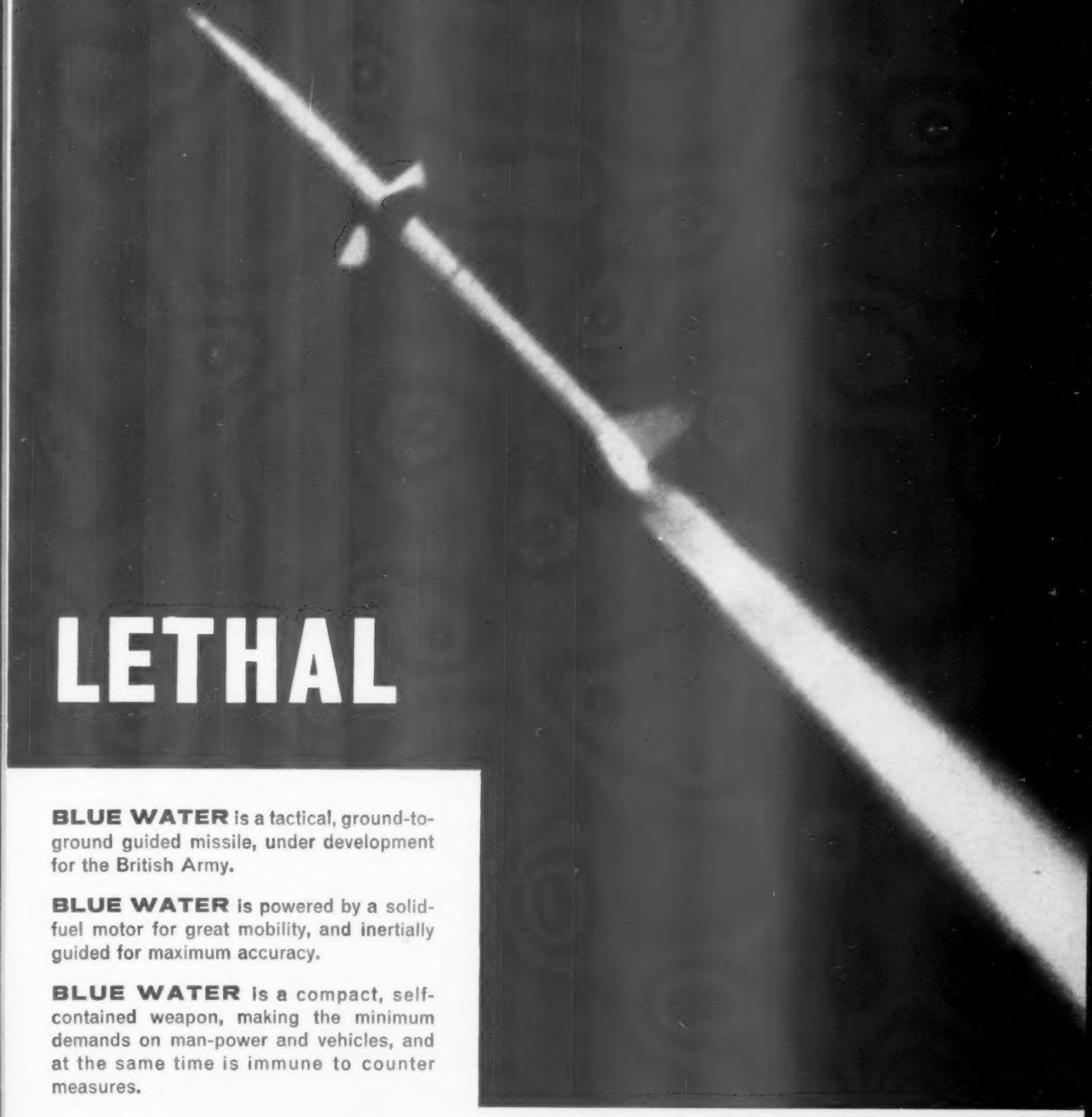
DR 168

COMPACT MOBILE



LETHAL

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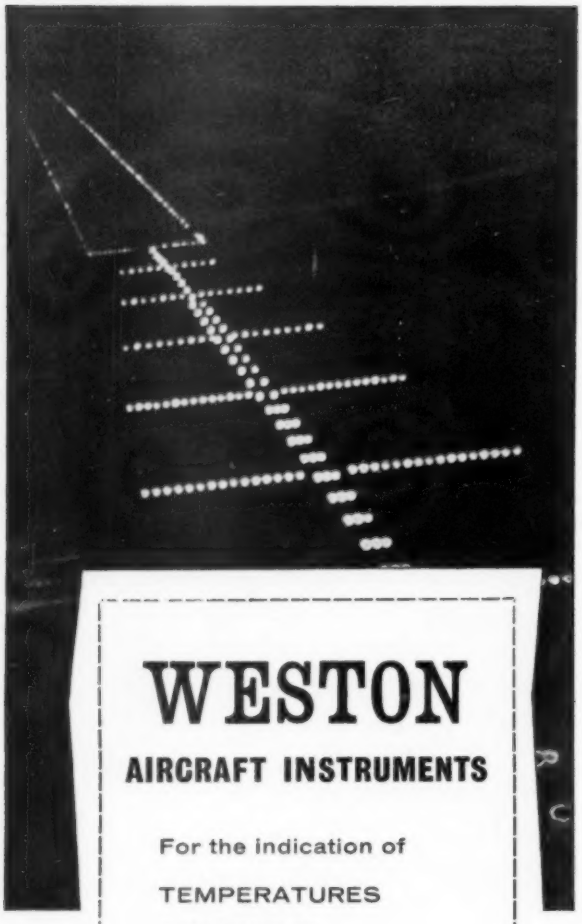

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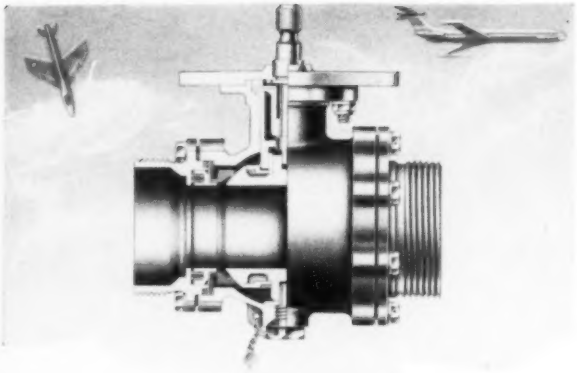

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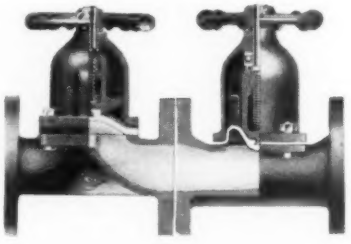

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Gliding Notes

by Dr. A. E. Slater

SHOULD a motorless cargo-carrying aerodyne be called a sailplane or a glider? The criterion is not whether the load is a "useful" one, but whether it is kept aloft by soaring technique. It was in his Skylark 3f sailplane that Humphry Dimock set off from Lee-on-Solent at 12.30 on Sunday, Jne. 18, from the top of a 700-ft. winch launch, to carry a "piece of heavy engineering" 25 miles N.N.E. to Lasham against a N.W. wind. It was a machined bronze weighing about 25 lb. Having delivered it at Lasham 1¼ hours later, he took another winch launch from there and got home in 40 minutes.

Meanwhile Stuart Waller, who was with the Cambridge Club's camp at the Long Mynd, flew his Swallow 300 km. from there to Yarmouth on the same day. This is the first time a Swallow has performed the distance leg of the Gold "C." Flights from Lasham that day included 100-km. triangles by Anne Burns, Brennig James and George Burton; and Ken O'Riley made Upavon out-and-return, 66 miles. Thermals continued well after 19.00 hrs. both there and at Dunstable, from which John Jeffries soared to 5,000 ft. in a Kirby Cadet.

Going back a week, Humphry Dimock had an unusual experience of a different kind on Jne. 11, when he soared in thermals coming up from over the sea off Lee-on-Solent, where the Portsmouth Naval Gliding Club operates. At around 12.30 B.S.T. he contacted one at 800 ft., climbed at 14 ft./sec. to 1,200 ft. and then saw a little cloud below him, instead of above, as one would expect. However, it grew up to envelope him at 2,000 ft.

Dimock then pushed off to a "huge body of cloud" about 5 miles inland which stretched E. and W. as far as he could see, parallel to the coast, with its base at about 3,500 ft. Going up at more than 20 ft./sec., encountering turbulence at times, he reached 11,300 ft., where the lift petered out, and then emerged on a southerly course to see Selsey Bill below. This counted as his Gold "C" height leg; he has been higher, but with a passenger.

The wind this day was blowing in a tight circle round a shallow depression centred over Yorkshire. Surface air temperature at Thorney Island was 14°C. at 06.00 hrs. and 18°C. at noon. But the sea temperature out in the English Channel would have been only about 14°; so unless the Solent was unusually warm for some reason, it looks as if the marine thermal may have taken off from the land on the other side.

Where a coastal strip is backed by hills, an onshore wind begins rising before it reaches the land, and the late Bill Liddell soared in lift of this kind at the Ulster Club's site. With a flat hinterland, as at Lee-on-Solent, an onshore wind gets slowed up by friction over the land, creating a sort of "hill" of slowed-up air over which the oncoming sea air has to climb. Soaring in such an upcurrent was done at Cranz on the Baltic coast of East Prussia, in 1927, by the late Johannes Nehring, but I have never heard of it being done since.

In either case, if the lower air is in an unstable state, any generalized upcurrent could be expected to divide into separate thermals.

On the day of Dimock's flight I was at Camphill, but we were too near the depression centre and there was nothing doing. However, the Derbyshire and Lancashire Club would like it known that they are open to take more entries in their northern Gliding Competitions from Jly. 29 to Aug. 7 inclusive.

* * *

NORMAN BRETT, chairman of Norfolk and Norwich Aero Club, who took to gliding only last year, completed his Silver "C" with 5 hr. 15 min. in thermals at Swanton Morley on Jne. 3. Four days earlier Alfred Warminger took off from there, released from tow over Reepham, and flew 259 miles to Dartmoor, landing 2 miles west of Chagford. On the way over Littleport, he encountered Ian Strachan, coming from R.A.F. Marham, who accompanied him as far as St. Neots and eventually landed at Yeovilton.

Strachan had another try for his goal-flight Diamond from Lasham on Jne. 2 and succeeded, turning at Edgehill (the Coventry Club's spare site) after 2½ hr., nearly coming down at Ely, and finally reaching Horsham St. Faith, near Norwich, after 6½ hr. in the air. For some unknown meterological reason the light northerly wind had swept northern Norfolk clear of cumulus.

* * *

FOR the first time in history a 500-km. race was set at this year's Polish national championships. Of the 55 competitors, 23 exceeded 500 km. (311 miles), though only two reached the goal. Lorne Welch, one of 15 foreign visitors, went 489 km. that day. He says the weather was fantastic and he has never seen a day like it before; cumulus clouds began to appear at 08.00 hrs. with their bases at 6,000 ft., and the last thermals of the day were still going strong at 19.20.

Lorne had to return by air on Tuesday, Jne. 20, but left Ann, his wife and team manager, behind in Poland to see what she could do after the championships were over. So, on that very day, she proceeded to beat the British national women's records for distance and goal flight with 526 km., which is 326.6 miles.

This exceeds her own goal record of 221 miles, set up in France, and Anne Burns' 325 miles distance flown in South Africa last January, though by too narrow a margin for official recognition. She is believed to have flown a Jaskolka, and is reported to have landed 3 km. short of the Russian frontier.

* * *

A LIGHTNING-STRIKE is reported from the East Anglian R.A.F. Gliding Club at Duxford. David Stephens was being towed in a Kite when he was knocked unconscious for a few seconds and then got shocks from the release knob which at first prevented him from releasing. After landing, he found the aileron cables were burnt nearly through. Recent sailplane strikes were suffered by Anne Burns at Kimberley in January and Mike Smith at Edgehill last summer, both high up in the storm cloud, but I cannot recollect any earlier ones.

Elstree's Rally and Display

ALTHOUGH a cold front lingered over South East England on the morning of Sunday, Jne. 18, producing a cloud base of little over 500 ft., the elements became progressively more favourable throughout the second half of the day. By the time that the Elstree Pilots' Rally became really active the weather was acceptable from the viewpoint of visitors, spectators and participants.

Just over 40 visiting aircraft of various shapes and sizes arrived for the afternoon, and the pilots of six of these took away trophies to show that they had some cause for personal satisfaction. These went to the first pilot to arrive, the oldest privately owned aeroplane, the least-experienced pilot, the pilot who had flown the longest distance to attend the Rally, the pilot bringing the youngest passenger and the pilot arriving in the most interesting aeroplane.

The flying display was short, but to the point. Six Chipmunks formated and five landed, the other climbing away to do a session of solo aerobatics. Then there were performances of a sailplane of the Handley Page Gliding Club; by C. A. N. Bishop in one of the specially modified Tiger Moths that seems as happy upside down as the right way up; and by a Tipsy Nipper.

A refreshing flashback was a demonstration by Duncan Simpson in Hawker's famous old Hart G-ABMR, now resplendent in Service markings and serials. A rather strong wind reduced the number of parachutists from four to one—the lone enterprising individual being C. M. Griffiths of the Southdown Skydivers. Finally, and most impressive of all, Vickers' Wisley-based Spitfire 5b AB 910, David Morgan up, gave an excitingly polished display of what flying at its best really is.—D.F.O.

Research into Low-speed Control

A U.S.A.F. test programme to investigate new and improved techniques of flight path control for recovery and landing of advanced aircraft having low lift/drag ratios, has been initiated in America. The system, known as LALSC (Low Altitude, Low Speed Control) has been tested with a specially modified North American Super Sabre designated NR-100F91-Na.

Flight investigations are carried out in constant speed approaches at glide angles ranging from 2° to approximately 16°. The object of this is to determine the best method of holding required approach speeds for various path angles, using all possible drag and lift devices at the disposal of the aircraft, such as throttle control, wing flap modulation, dive brakes, boundary layer control and thrust reversal.

The LALSC system-changes in the NF-100F provide the craft with either a manual or automatic let-down and flare-out computing system which allows the aircraft to fly a predetermined glide path manually selected by the pilot. This is accomplished by the installation of a glide slope measuring system, and a control air data system, plus modifications to the existing automatic flight control system.

The aircraft's J57-21A engine has been modified by removal of the afterburner and a Rohr thrust reverser installed. The latter gives airspeed control during glide-path approaches in descents ranging from 12° to 16°, and reverse thrust braking of the aircraft during landing run.

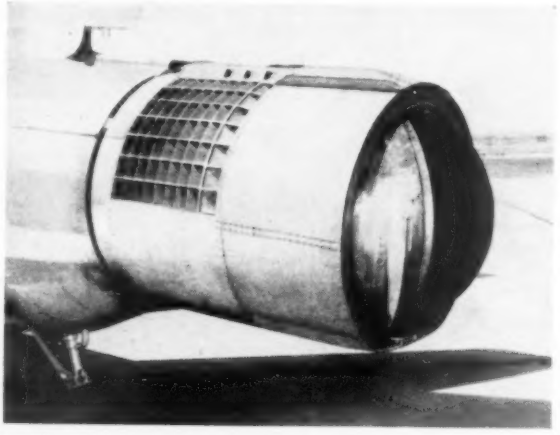
An enlarged perforated speed brake measuring 33 sq. ft. has also been installed. During any manual operation, this speed brake can extend to a maximum of 30°. When operating under the automatic flare-out system and with the speed brake in "automatic," however, the brake will extend to 45°.

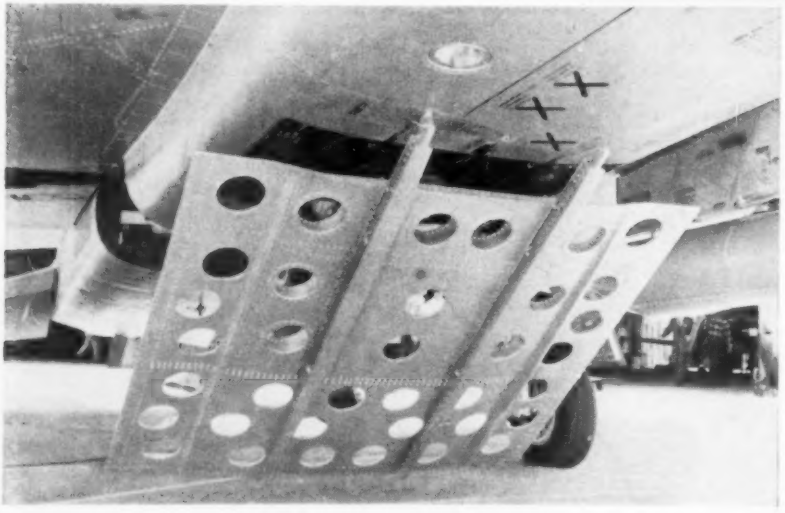
At "flare trigger" (altitude when flare-out actually begins), the speed brake retracts completely. Should the manual speed brake system be in operation, the 30° extension could still be maintained. By this means the system ensures that the oversized speed brake does not touch the runway during any landing.

Other changes to the aircraft include modified wing flaps, incorporating boundary-layer control air ducts, installed to improve wing flap efficiency at low speeds. The bottom area of the fuselage has been redesigned to accommodate four radar altimeter antennæ; a radar altimeter antenna pod for the forward pair of antennæ has been added under the nose. A modified tail skid provides clearance for the thrust reverser during landings.

This interesting research craft has also been used for the simulation of the landing approach of a boost-glide vehicle such as Dyna-Soar. These tests may lead to the elimination of the need for long runways for aircraft of the X-15 type.

For these tests, the thrust reverser is activated at about 6,000 ft., the speed brake lowered and, when the craft is near to touch-down, the wing flap boundary-layer control is put into action. The overall effect of this is to produce the lift/drag condition of a Dyna-Soar.—HOWARD LEVY.





Above, the Rohr thrust reverser fitted to the Super Sabre used in the LALSC tests described.

Left, a close-up of the large airbrake mounted under the fuselage.

Howard Levy photographs

Correspondence

New Name for the A.T.C.

IT was with great interest that I read the letter in the Jne. I issue from Mr. Geoffrey Dorman regarding the title of the Air Training Corps, as I am closely connected with the Corps. It has been apparent for some time now that confusion could arise with the initials A.T.C. and in fact for some little while now, in correspondence from Headquarters Air Cadets at White Waltham, the terms "Air Cadet Units" and "Air Cadets" have been used in preference to "A.T.C. Units" and "A.T.C. Cadets."

I am not in agreement with Mr. Dorman's suggestion that the Corps should be renamed Air Cadet Corps, as abbreviation of this could lead to confusion with the Army Catering Corps. I do feel, however, as the Air Training Corps is now so directly linked with the Royal Air Force, that it might be retitled "The R.A.F. Cadet Corps."

Guildford. R. V. HENDON.

Wassmer Representation

WE were concerned to see that in your issue of Jne. 1, under the article "Personal Flying," we are reported as taking the distributorship for the French Wassmer. This is incorrect, and we should be grateful if you could, at your earliest convenience, have the statement corrected. We make this request because, from previous experience, we know the bad feeling caused on the Continent, by people falsely representing themselves as distributors.

What actually transpired between ourselves and the manufacturers of this particular aircraft, was that we undertook to display the aircraft in this country on their behalf, and to render all possible assistance in advertising, etc., with a view to investigating the British market for this particular type. The distributorship will only be discussed in the event of the British market showing favourable reaction.

Portsmouth.

A. E. HAWES,
General Manager,
Hants and Sussex Aviation, Ltd.

Polish Sailplane Achievements

IN the last paragraph in the "Gliding Notes" section, of your issue for May 25, Dr. A E. Slater, commenting upon the *Aviasport* revelations concerning soaring conditions in Poland, comes to the conclusion that the S.G. gliders used in Poland must have been German SG-38 open primary trainers. To put the record right I would like to point out some hard facts.

All gliders and sailplanes used in Poland in the between-war years, beginning with the earlier gliding attempts in the early 'twenties, were of national design and manufacture. No German SG-38 gliders nor any other machines of foreign origin were imported to Poland, except for single examples of Condor and Rhönsperber bought in the immediate pre-war years for evaluation and comparative trials with Polish sailplanes. These were flown from the Ustianowa centre, where the Rhönsperber crashed, killing the pilot.

The Polish SG sailplanes had nothing to do with the German gliders carrying the same designation letters. They were designed by Dipl.-Ing. Szczepan Grzeszczyk, creator of the gliding movement in independent Poland, discoverer of the famous soaring sites in the Bezmiechowa region and holder of the first Polish national gliding records.

All his machines—from the SG-21 Lwow of 1931 to SG-7 of 1936—were high-performance sailplanes with circular-section wooden monocoque fuselages. Many versions of his designs were used in considerable numbers in Poland, his SG-21 Lwow and SG-28 participating as the Polish entry in the 1932 Rhön Gliding Championships in Germany, and achieving notable results.

No distance flight for the Silver "C" (50 km.) was carried out in Poland on an open-frame primary trainer before the last War. The only cross-country to be made on such a machine covered a distance of only 6½ km. (4 miles) in a straight line. This was achieved on a standard Polish primary Wrona *bis* (Reg. SP-1056) on Jne. 28, 1938.

The aircraft, towed behind a car, took off from the LOPP Gliding School at Stara Milosna near Warsaw and cast off at 90 m. (295 ft.). It caught a thermal over the airfield and rose to some 600 m. (2,000 ft.), landing 15 minutes later at Okuniew, 6½ km. away.

In spite of the short distance covered, this is believed to be the first occasion on which cross-country flight has been made by an open-frame primary glider, and the first for which the take-off has been made from a flat ground with the help of mechanical means other than a tow behind aircraft. During the following days the same Wrona *bis* was used for attempts at longer distance flights from Stara Milosna, but these were soon stopped by the authorities, strictly forbidding such undertakings on gliders of this category.

In conclusion, I would like to say that in my view the only members of the gliding fraternity who really have the right to blame the "soaring conditions" for lack of appropriate earnings in Diamonds, are, of course, British. May I also remind my French friends from *Aviasport* that during the 1958 and 1960 World Gliding Championships, Poles did remarkably well, flying in exactly the same conditions as everybody else. Which just proves that their Diamond achievements are the result of superb flying skill of Polish pilots and technical excellence of Polish SZD sailplanes and of nothing else!

London, N.9. J. B. CYNK.

Groundabout

Fleet Street Strikes Again. If the newspapers are right, some airlines are operating on the desperate "Profit or Bust" principle. There was that Viscount, for instance, which "returned to London Airport seven minutes after taking off from Düsseldorf when a passenger reported flames coming from an engine." Even Darts have their limits, as did one of the Wright engines in a DC-7C when a propeller ran wild recently. It threw itself and prop into the Atlantic, leaving the 7C to make Prestwick on three, where some light was shed, at least for one of our dailies, which reported that "230 passengers left for destinations in Scotland . . . the other 50 flew on to Amsterdam in another plane."

*

Moore for the Skylark. Press photographers have their worries, too. At the R.A.E. Open Day our George Moore, to get a picture of the Skylark rocket head, banged off his flash and at once a great buzzing and whirring began within. Thinking he might have started the launching sequence, George stood back and waited with interest. But all was well—'twas only a flash in the can, so to speak—his flash had energized the Skylark's selenium cells.

*

East beats West. These pictures, from the latest issue of the Japanese monthly *Aireview*, show the gay Nipponese approach to man-powered flight. The driver is pedalling at max. boost and the draught is at least disarranging the curtain. The caption speaks of GTOL and until editor Eichiro Sekigawa enlightens me, I can only guess what G may mean. Gymnastic? Grinding? Gravimetric (determined by weight)? Or even Gallinaceous, pertaining to domestic fowls—about the measure of the amusing device's aviating powers.

by Gyro

Industry Record

Missile Tracking Aid

FOR the high-speed processing of digital radar information the Solartron Electronic Group, Ltd., is to supply digital computing and data handling equipment to the R.A.E. for use at the Aberporth missile range. In effect this equipment creates a radar picture so that the missile is observed throughout its approach to its target, during which time the "control brain" causes all other associated equipment to follow it as well.

The polar co-ordinates of two missiles are provided in digital form by the outputs of two AN/FPS 16 radar installations. This information is fed over land lines to a control centre where it is converted to Cartesian co-ordinates. A number of parallax corrections are made corresponding to the location on site of other slave equipment, such as telemetry aerials, photographic tracking gear. Information is then fed via digital/analogue convertors to several plotting tables for observation, while other convertors feed high-precision servos, which are used to drive synchro-transmission systems connected to the remote slave equipment.

All settings and changes are automatically recorded during a trial for later examination and punched paper tape input facilities are provided for checking purposes.

The computing equipment consists basically of six Solartron Minimal computers. A particular feature of this equipment is its high rate of computation, the requirement being for two polar/Cartesian conversions, 14 parallax corrections and four Cartesian/polar conversions, all to one part in 10^6 accuracy performed every 50 milliseconds. Installation of the equipment is scheduled for the end of this year.

Telemetry Contracts

Orders valued in excess of £100,000 have been received by W.S. Electronics, Ltd., for D145 and D156 telemetry transmitters to be delivered this year. This equipment forms part of the R.A.E. telemetry system which was used in acceptance tests for the Short SC.1.

Component Testing by B.O.A.C.

IN order to facilitate the production testing of certain specialized components and equipment for its fleets of turbojet and turboprop aircraft, B.O.A.C. has set up a special test-house at London Airport. Claimed to be the largest of its type owned by any European airline, it is fully equipped to test the performance, after overhaul of air conditioning, pressurisation and electrical power-generation equipment.

According to the Corporation, with this sort of work under its direct control it can handle "any peaks which arise for operational reasons and can provide a testing programme giving the utmost flexibility." It can also, it says, maintain a better control over the technical standard achieved and thus permit the most rapid development of component life.

Useful Equipment

From Drallim Industries, Ltd., comes news of some of their recent products that have aeronautical possibilities. This pneumatic engineering company was formed three years ago and its range of test panel equipment components, flow gauges, and control and multi-way switch valves are finding increasing application within the aircraft industry.

The rotary switch valves produced have been designed for the distribution of either gases or liquids between a number of independent or interconnected pipes. They are designed to cover flow in either direction and have no appreciable pressure drop. Similar in operation to electric rotary switches, the valves are of standard manufacture with single, dual or triple connector banks. For flow control of gases and liquids the company produces a range of fine control valves for either panel or base mounting.

A Drallim subsidiary is Cargo Aids, Ltd., who at present hold the U.K. marketing licence for the cargo lifting and tie-down devices manufactured by the Eastern Rotorcraft Corpn. of America. This range of products covers tie-down equipment with a load capacity ranging from 1,250-35,000 lb., helicopter cargo slings and nets for loads up to 10,000 lb., and a helicopter lifting hook of 2,500-15,000-lb. capacity which has automatic release by touchdown in addition to the pilot release. Future plans are for the manufacture of all this equipment in this country.

New Fuelling Dispenser

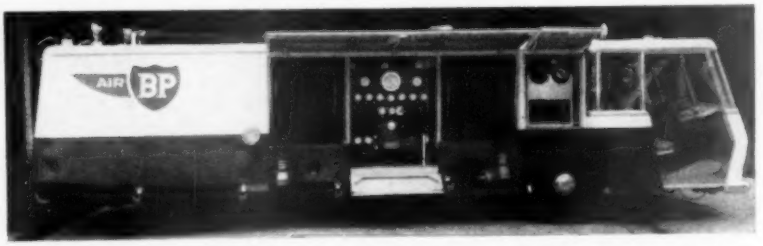
An all-purpose fuelling vehicle for optimum rate fuelling of all civil aircraft at present in service has been designed by Rellumit (London), Ltd., in conjunction with B.P. Trading, Ltd. Known as the Ranger dispenser, it has two main methods of operation

When fuelling the large turbojet types such as Boeing 707 or Douglas DC-8, it is positioned under the wing, thereby enabling the operator to use the upper deck of the dispenser as a working platform for connecting the twin 3 in. dia. x 10 ft. upper deck hoses. In the case of the Boeing 707, where the fuelling points are lower, two "wells" have been built into the top deck, one at the front of the dispenser and one at the rear, thereby allowing the operator to stand whilst coupling-up the hoses. Both hoses are capable of a maximum flow rate of 300 Imp.g.p.m. each, giving a total capacity of 600 Imp.g.p.m.

For aircraft of the Caravelle and Comet types, the dispenser is used in the "stand-off" position. In this case the side mounted, hydraulically operated, 2½ in. dia. x 80 ft. twin hose reel hoses are brought into operation. The length of hoses carried on the hose reels, together with the intake hose, allows one dispenser to fuel both wings of the aircraft simultaneously. Both hoses are capable of giving a maximum flow rate of 200 Imp.g.p.m. each.

To enable the Ranger to operate with the maximum flexibility a high-duty pump has been installed, deriving its power from the full-torque power take-off fitted to the gearbox. Through this the dispenser may be used in conjunction with a Bridger tanker for fuelling duties, maintaining the flow rates previously mentioned.

The dispenser can also be used, together with a Bridger tanker for bulk defuelling, any of the four hoses being used for this operation—the maximum flow rate being 70 Imp.g.p.m. There is also a manually operated defuelling circuit for aircraft gallery line drainage, when operating with a hydrant system.



The Rellumit Ranger all-purpose fuelling dispenser showing the central control panel between the side-mounted hose reels. These are hydraulically powered for both unwind and rewind. The main fuel inlet manifold is immediately behind the aft hose reel unit and is duplicated on the other side of the vehicle.

Aviation Calendar

Jne. 30

Hatfield.—D.H. Technical School Old Boys Mid-summer Ball.

Sicily.—Palermo Aero Club 13th Tour of Sicily; until Jly 3.

Jly. 1

Deauville.—Invitation Air Rally for Members and Associate Members of the Royal Aero Club; until Jly. 2.

Jly. 5

London.—The Kronfeld Club Film Show, "History of U.S.A.F. 1939-42, including Pearl Harbour," at 74 Eccleston Square, S.W.1.

Oxford.—The British Institution of Radio Engineers 1961 Convention, at headquarters at Christ Church, technical meetings in the Clarendon Laboratory; until Jly. 9.

Jly. 6

Rome-Turin.—Italian Aero Club International Aviation Contest; until Jly. 8.

Jly. 7

Bletchley.—College of Aeronautics, Cranfield, Presentation Ball, in the College, from 10 p.m. until 5 a.m.

Personal Notices

BIRTHS

Blockey.—On Jne. 18, at R.A.F. Hospital, Ely, to Gillian Gayle (*née* Oliver), wife of Flt. Lt. J. Blockey—a daughter.

White.—On Jne. 10, in Padstow, Cornwall, to Dinah, wife of Flt. Lt. D. B. White, R.A.F.—a daughter.

DEATH

Caris.—On Jne. 5, Flt. Lt. David Athol, R.A.F.

Recommended Reading

"THE AEROPLANE Directory of British Aviation": 1961 Edition. 547 pages. 35s. net. (By post 36s. 6d.)

"THE AEROPLANE Pictorial Review": No. 5. 128 pages. Ill. 12s. 6d. net. (By post 13s. 7d.)

"Aircraft and Air Power," By F. G. Swanborough. 112 pages. Ill. 10s. 6d. net. (By post 11s. 5d.)

"Camera in the Sky": By Charles Sims. 224 pages. Ill. 25s. net. (By post 26s. 6d.)

"Principles of Helicopter Engineering": By J. Shapiro. 448 pages. Ill. 55s. net. (By post 56s. 9d.)

"Interplanetary Flight": Second Edition: By Arthur Clarke. 152 pages. Ill. 12s. 6d. net. (By post 13s. 4d.)

"The Exploration of Space": By Arthur Clarke. 212 pages. Ill. 8s. 6d. net. (By post 9s. 5d.)

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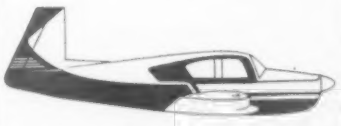

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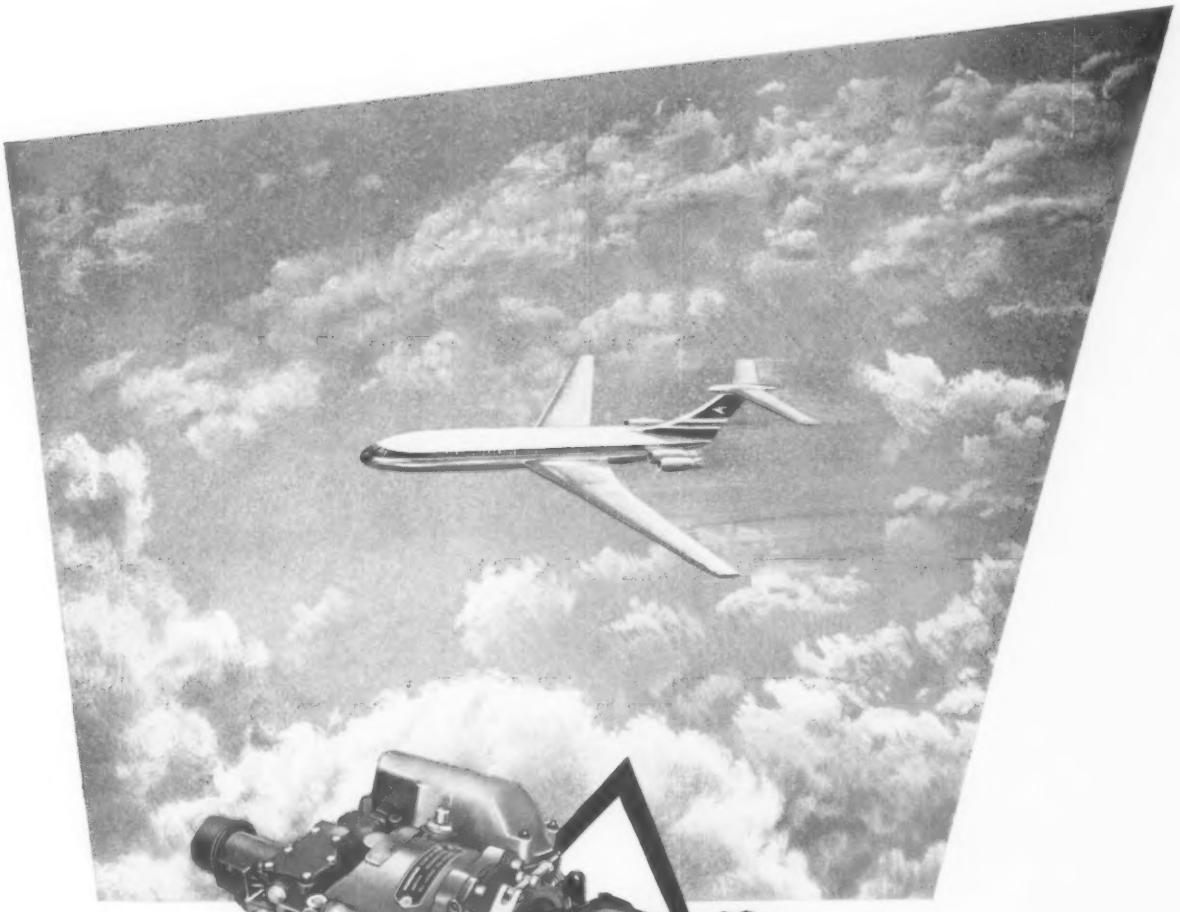

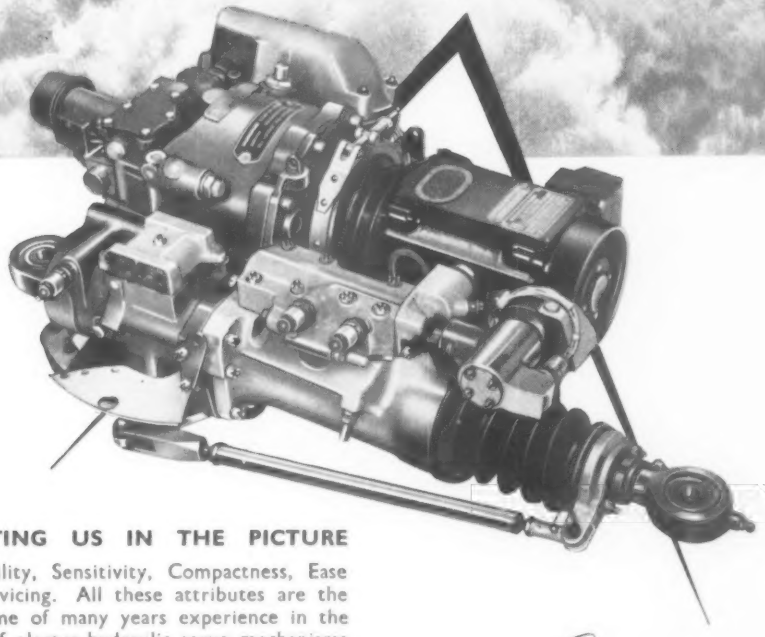

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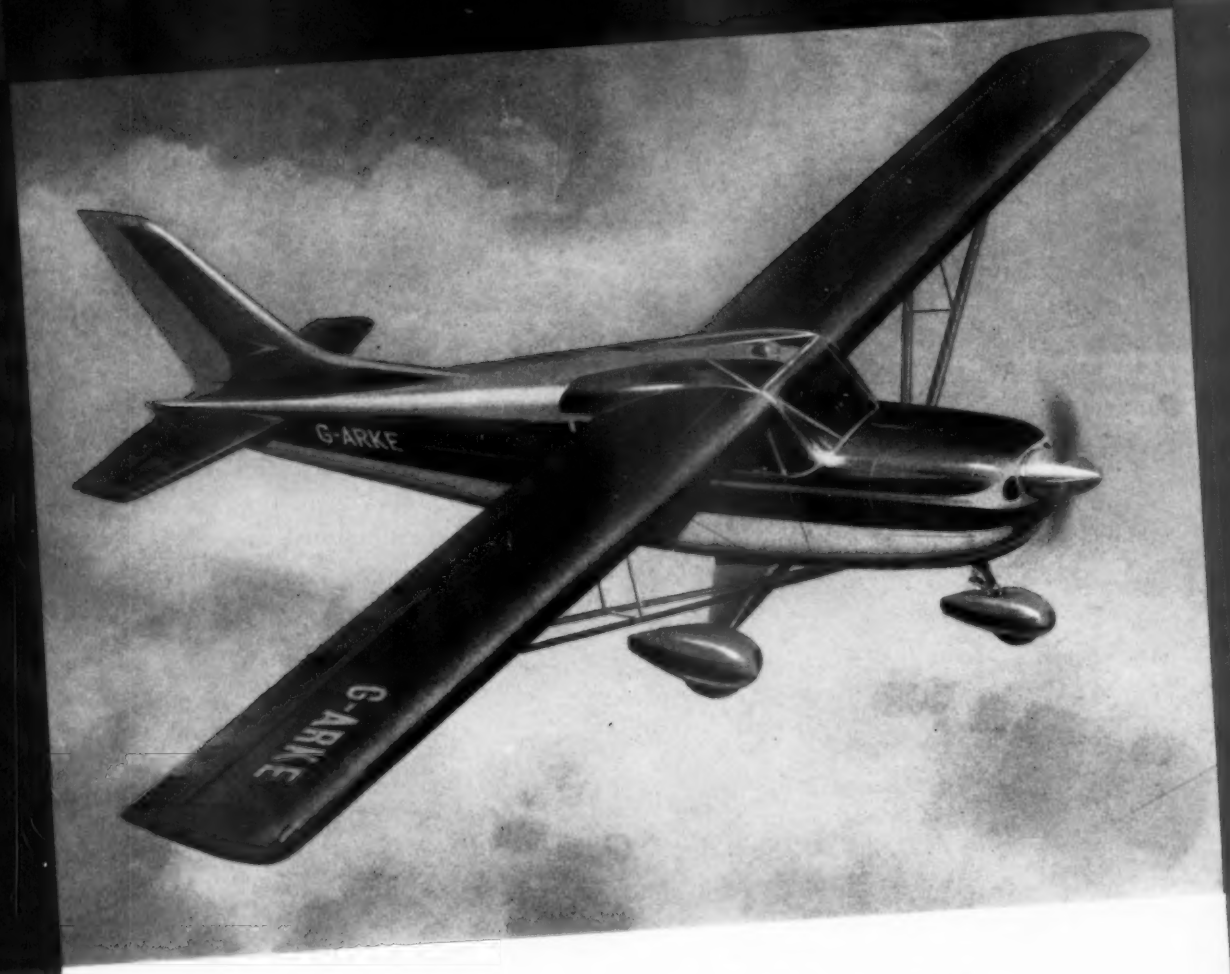

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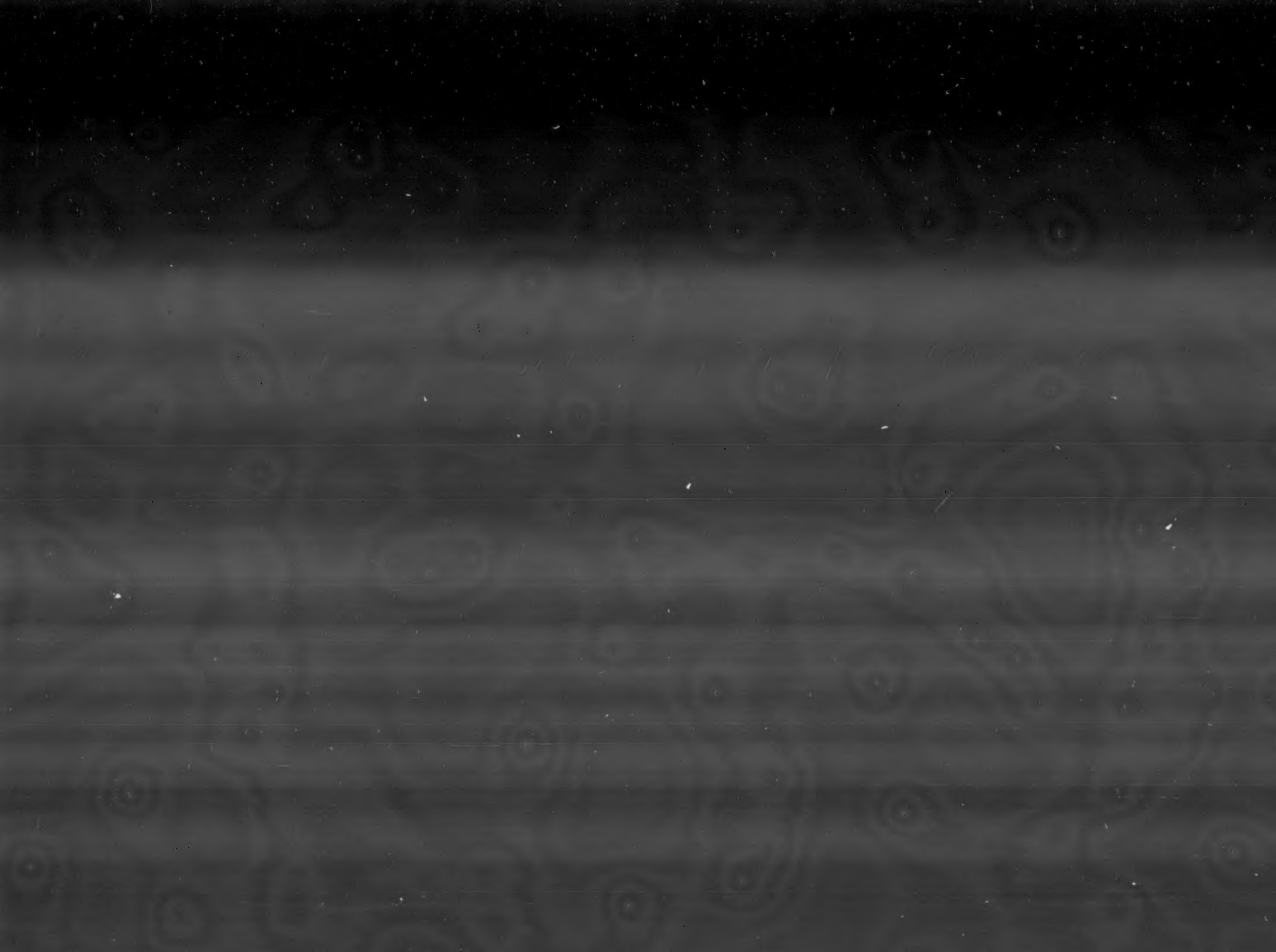
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